VOL. XXII, No. 1

STEIGER

JANUARY, 1949

THE TOOL ENGINEER

OFFICIAL PUBLICATION: AMERICAN ASTE SOCIETY OF TOOL ENGINEERS

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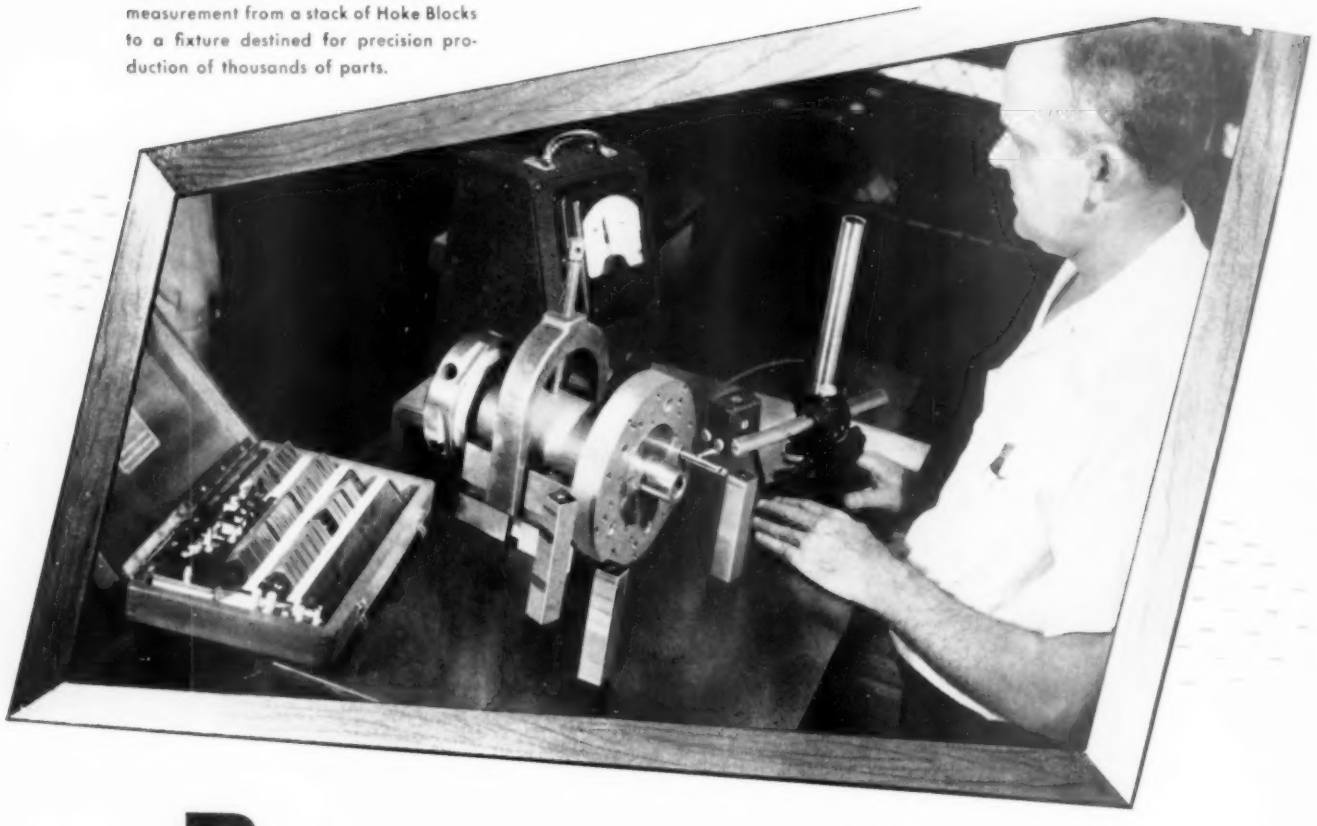

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Jan., 1949

Vol. XXII, No. 1

Editorial

That Civilization May Endure

WORLD HISTORY records the stories of civilizations that rose, flourished for a time, and then fell into ashes from which a new civilization eventually grew. Engineering, in some form, played a vital part in the success periods of each of these civilizations. However, it is important to note that these people in their engineering achievement reached a certain point and went no farther—they accomplished, but they did not *progress.*

The pyramids of Egypt are numbered among the Seven Wonders of the World—they stand today as a monument to the engineering genius of an ancient day. But they stand in a land of poverty, disease, hunger, and squalor, among people whose forebears poured their country's resources and energy into useless, non-productive structures. It is true that the ancient Egyptians contrived a then wonderful system of canals and locks—but in the intervening centuries there has been very little attempt to improve them.

Today, civilization cannot be considered as the pattern of life within even continental boundaries—it has to be looked upon as encompassing the peoples and nations of the world. Engineers have been largely responsible, directly or indirectly, for creation of this world community. Therefore, it is their duty to accept a large share of the responsibility for the economic welfare and stability of this one-world structure.

Advancements made by engineers in this and other progressive countries have made us neighbors with backward lands thousands of miles away—lands whose fortunes cannot but affect our own. It has become not a charitable duty, but a selfish economic interest, for us to help these countries build civilizations which will rise, flourish and not fail, but progress and endure.

These countries need more than our dollars, they need the skill and knowledge which has helped build the civilization we know in America. These countries need American engineering, in all its branches, to help them help themselves. While politicians and statesmen will set the course for economic stability, it will be the problem of the engineering profession to equip backward countries to become useful citizens in a world-wide civilization.

Recently, two moves have been made in that direction.

Admitting its industrial backwardness, the government of Iran has contracted with a group of U. S. engineering firms to advise them on the building and spending necessary to build a strong economy. Iran, the flourishing Persia of past centuries, declined because she did not or could not progress. Rich in money from her oil fields, she has virtually no industry, and her agricultural production has steadily declined because of lack of maintenance and improvement of the ancient irrigation systems. Today, Iran has turned to American engineering to strengthen her economy and help her become less dependent on outside sources for goods and services.

Also, in October a new policy appeared in administration of the Marshall Plan aid to China. A joint U. S.—Chinese government committee, recognizing that assistance in engineering and management would have to be furnished almost as though it were reconstruction machinery, employed a U. S. engineering firm to serve as its technical staff.

Naturally, there will be criticism of both of these ventures. It is safe to predict that perfection will not be the result. However, they are significant of the part engineering will play in the building of a stable world economy.

A stable world economy will not be achieved as long as any part of it is in a state of decay. We can help other countries as we have helped ourselves and look forward to a world in which civilizations flourish, change to meet changing conditions, and continue to endure.

That is a challenge, not only for the new year just beginning, but one we will have to face for many years to come.

I. F. Holland

President 1948-49

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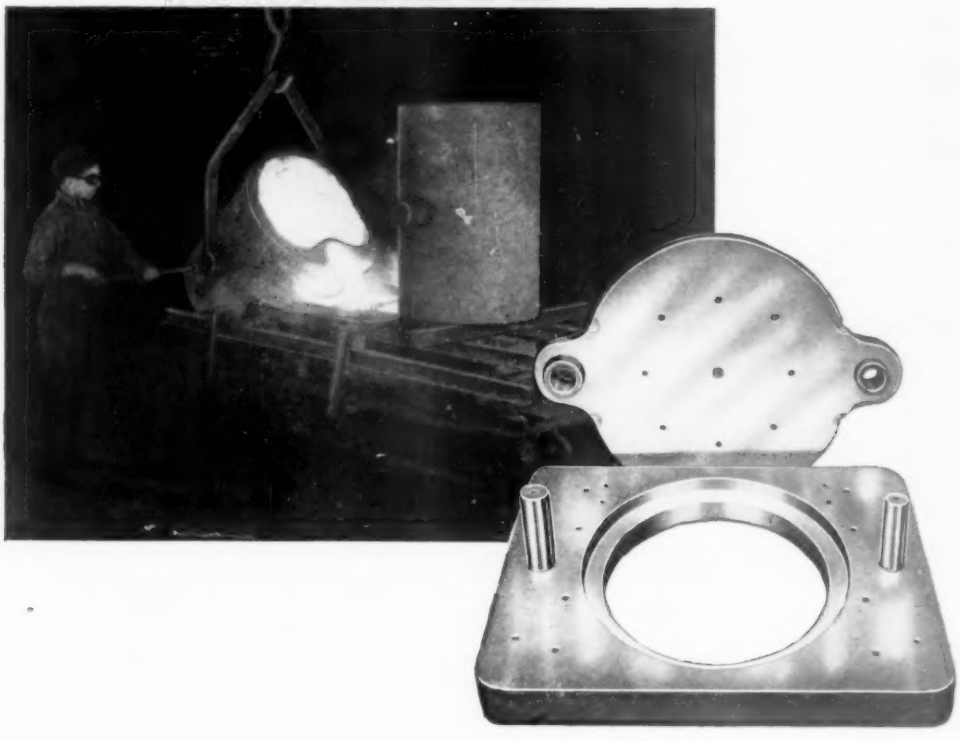

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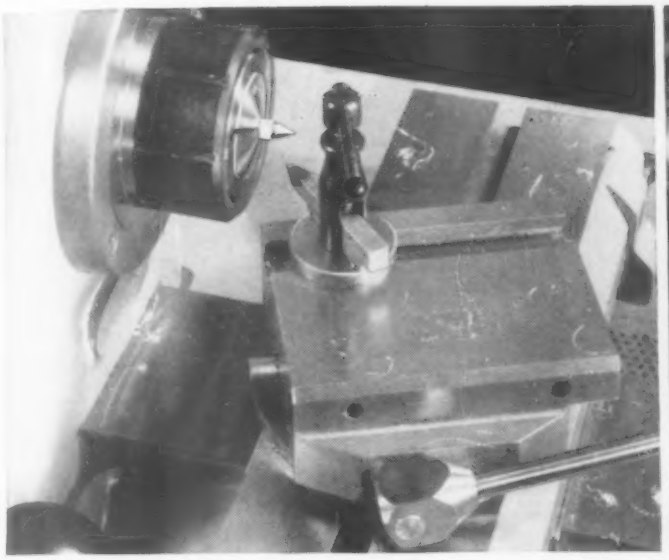

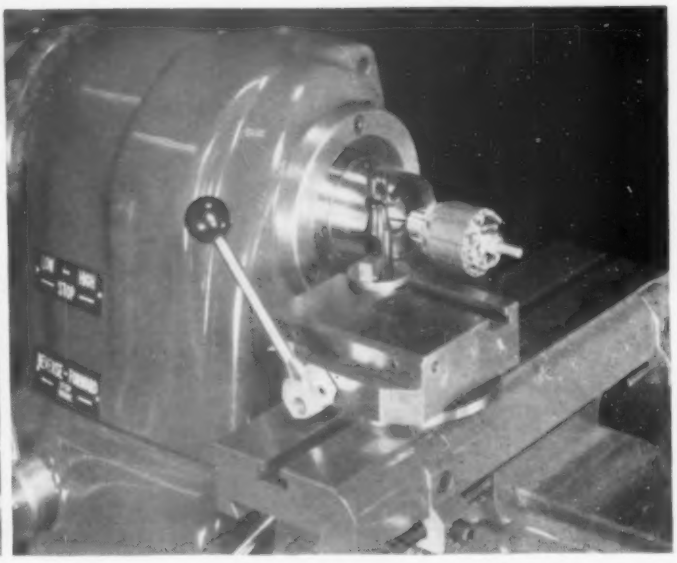

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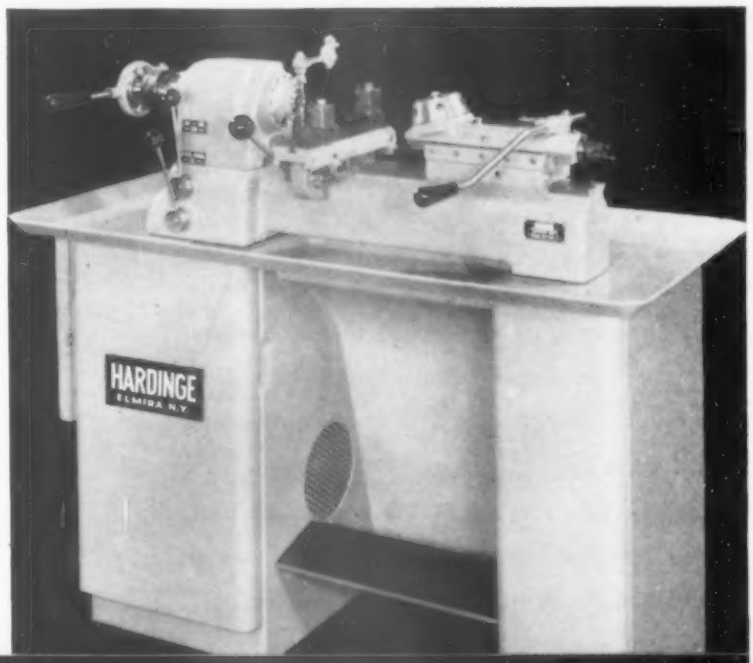

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It's the New, Finer Besly "Forty-Niner"

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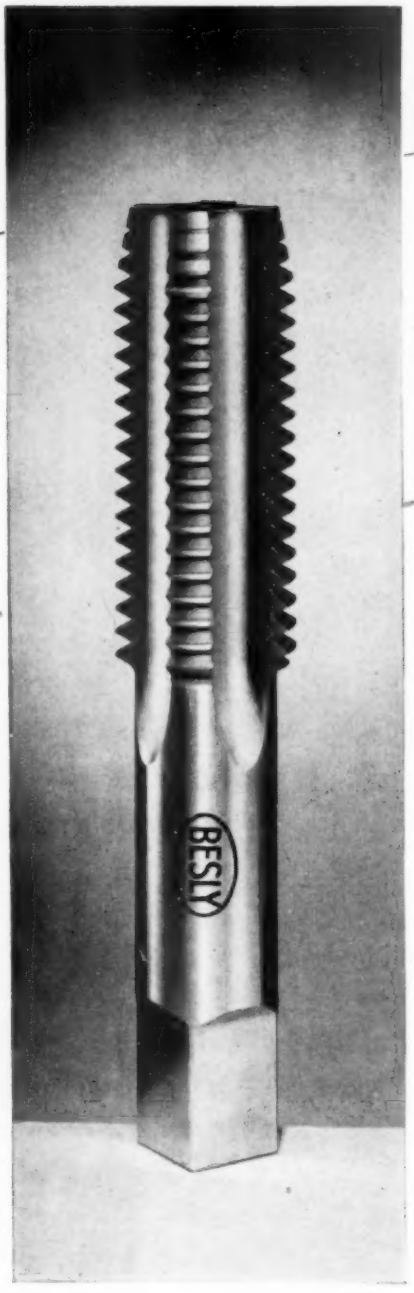
If you are not now using High Speed Besly Taps, then make your own performance tests. Compare your present source with Besly. Call the nearest Besly distributor . . . whether it's standard or special you need . . . and judge for yourself. Ask, too, about deliveries of high speed specials. Besly's handling of these is *really* fast.



BESLY'S "HELPING HAND" HAS 5 STRONG FINGERS

Fast Delivery
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UNSURPASSED ACCURACY At These Vital Points!

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Micro finish, concentric to tenths of thousandths. Cuts freely and to size without burring or welding.

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Correctly designed to provide freer chip flow and longer tap life.

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For angle and lead accuracy, elimination of gauging problems and control of pitch diameter to tenths of thousandths. Ground from the solid.

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GAGING SURFACES are portions of a sphere

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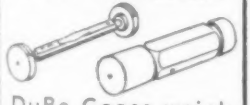
DuBo Plug Gages have already won an excellent reputation for long-enduring service. Exceptionally long wearability is inherent in their basic design. *Now chromium plated gaging surfaces, available at very little extra cost, add a tremendous plus to their service life.*

For long runs and the more abrasive materials specify *Chromium Plated* DuBo Gages.

Be Sure To Write For DuBo Bulletin

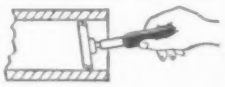
*Patents Pending

LIGHT IN WEIGHT



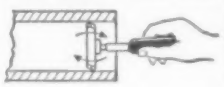
DuBo Gages weigh 70% to 80% less than cylindrical plug gages of equivalent size.

EASY TO ENTER



Simply tip handle slightly above bore axis. Enters even undersized bores easily.

DEFINITE CHECK



Whether or not handle drops freely below center is definite yes-or-no answer.

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Poughkeepsie, N.Y.

Got a Benchgrinder?

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Sharpening a tool bit.

Sharpening a chisel. Cutting BX cable.

Cutting a circle out of sheet brass.

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In Money Tools

* **"Freedom from flaw or defect; firmness, strength, trustworthiness."** *Webster*

Cemented carbide tools have been a boon to metal-working industries in their ability to increase production and decrease costs. To do this consistently and at minimum expense for maintenance, they must have soundness and uniformity. These properties are attained to a marked degree in Kennametal by distinctive processing and precise laboratory control throughout every stage of manufacture—from refinement of raw materials to sintering of finished product.

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For 15 years we have had "managed" currency, and with it has come uncontrollable inflation. Dollars are plentiful, but "porous". The cost of living—for families and business concerns—has skyrocketed. Uncertainty prevails.

Return to sound money—an honest medium of exchange★—will help stabilize our economy, put a curb on the potentially infinite use of currency, automatically check inflation and dangerous expansion of credit, and restore confidence. Individuals can then know with certainty the worth of earnings and savings; businessmen will be enabled to continue worthwhile enterprises with assurance. Palliatives may ease the pain of economic ills, but sound money is an effective cure.

★ **Bill H. R. 5031** introduced into the House of Representatives, January 20, 1948, by Congressman Buffet of Nebraska cited as the "Gold Standard Act of 1948."

A BILL

"To restore the right of American citizens to freely own gold and gold coins; to return control over the public purse to the people; to restrain further deterioration of our currency; to enable holders of paper money to redeem it in gold coin on demand; to establish and maintain a domestic gold coin standard; and for other purposes."

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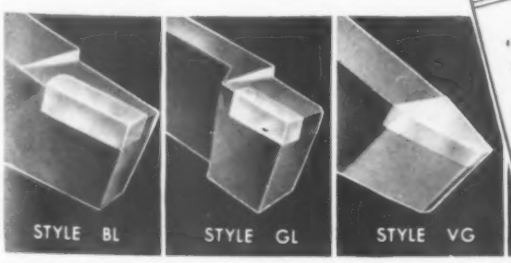
KENNAMETAL Inc., LATROBE PA



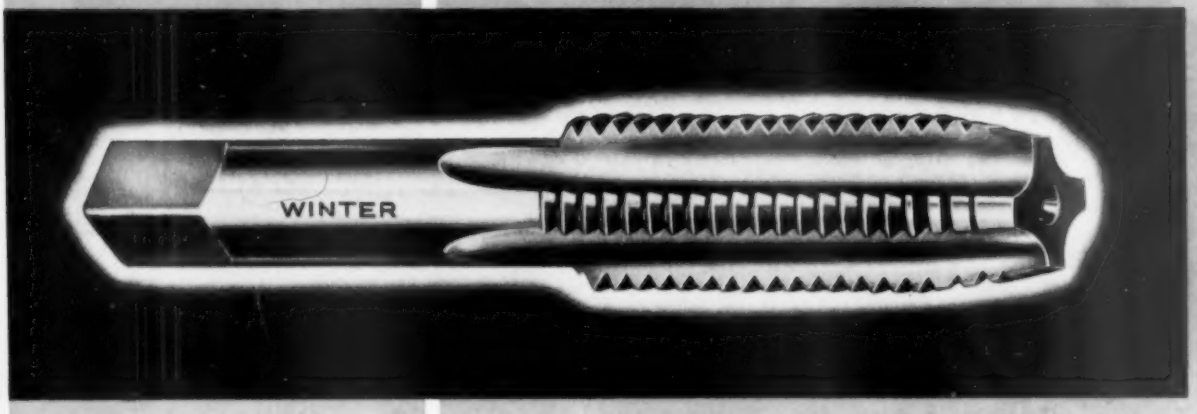
KENNAMATIC STYLE 12TK

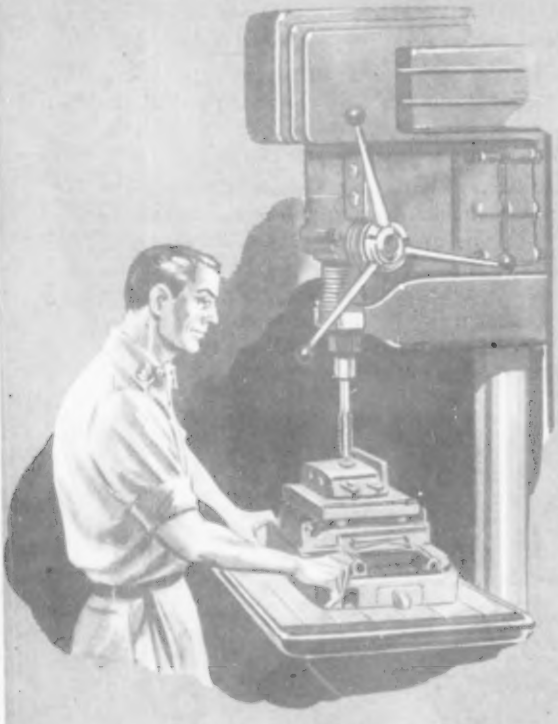
KENNAMATIC STYLE 6RK

SERRATED MILLING CUTTER BLADES

WINTER

TAPS IN ACTION





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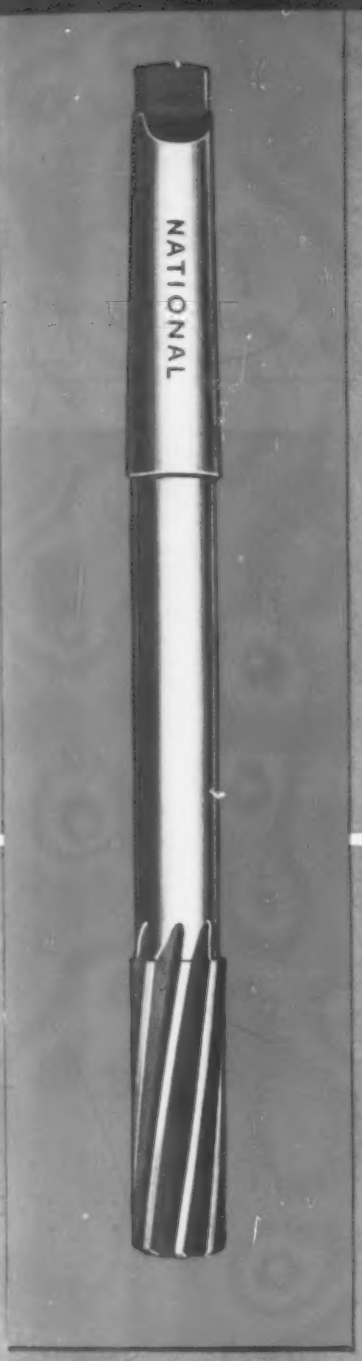

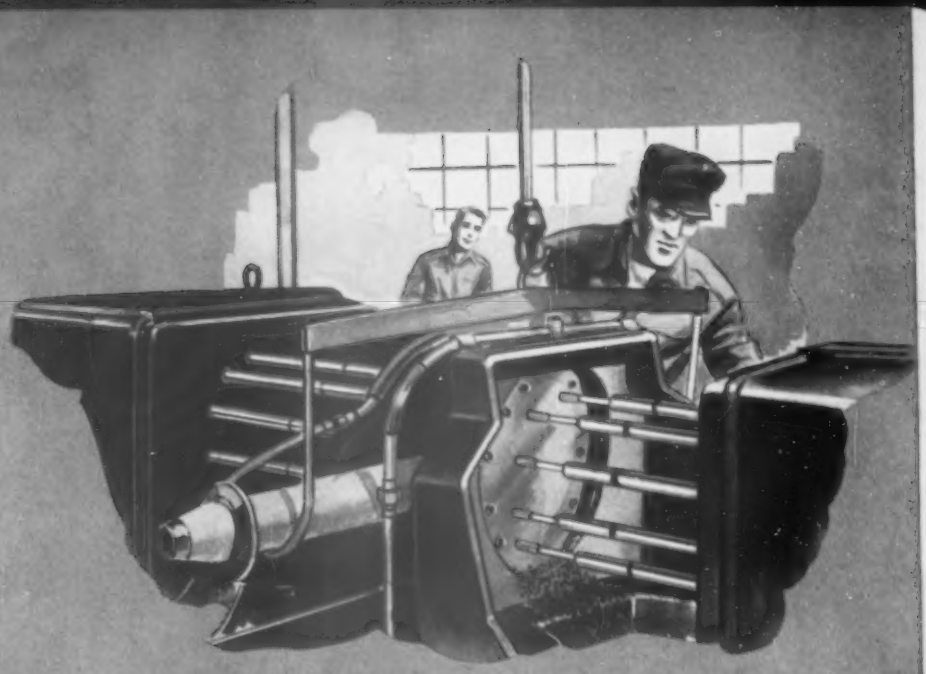

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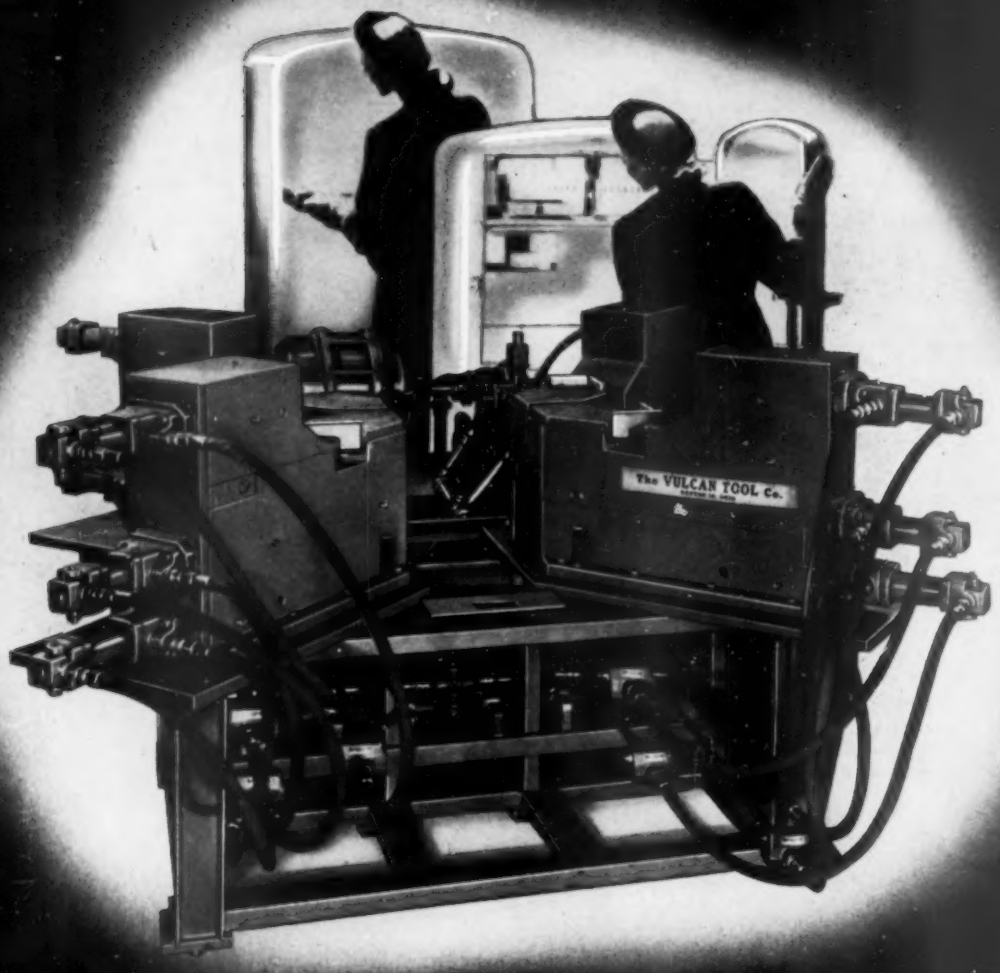
4 CORNERS
formed every
7 SECONDS



Hydraulic Corner Forming Unit

speeds refrigerator food compartment liner production

Forms 4 corners simultaneously

Saves man hours

Saves floor space

For example, common practice was to blank and form one corner at a time, weld, and then metal finish. Dies were expensive, so was finishing department labor. With Vulcan's Hydraulic and electrically controlled Forming Unit all four (4) corners are formed at the same time every seven (7) seconds. One operator. No punch presses needed.

Let's talk about special tools and machinery for speeding *your* production. For better acquaintance ask for Vulcan Equipment List.

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COMPLETE TOOLING PROGRAMS

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No. 1896

No. 1900

No. 1903

No. 1902

No. 1895—Hi-Helix Double End Mill. Four flutes. For general end milling.

No. 1887—Hi-Helix Ball End Mill. Two flutes. For milling fillets, round bottom holes, radius-bottom slots, etc.

No. 1896—Hi-Helix Double End Mill. Two flutes. Ideal for milling keyways, slots, channels, etc.

No. 1898—Hi-Helix Single End Mill. Two flutes. For milling keyways and slots from the solid, can be fed directly into work without previous drilling operation.

No. 1900—Hi-Helix Long Single End Mill. For milling out slots, recesses, etc., that cannot be reached by regular length mills.

No. 1895—Small Diameter Hi-Helix Double End Mill. Four flutes.

No. 1896—Small Diameter Hi-Helix Double End Mill. Two flutes.

No. 1903—Hi-Helix Long Single End Mill. Right hand cut—left hand spiral. The tool for deep slots where regular length mills will not reach.

No. 1897—Hi-Helix Single End Mill. For general end milling.

No. 1902—Hi-Helix Single End Mill. Right hand cut—left hand spiral. Used in die work, etc.

No. 1899—Hi-Helix Long Single End Mill. Two flutes. For deep milling of slots which cannot be reached with ordinary length mill.

No. 1887

No. 1898

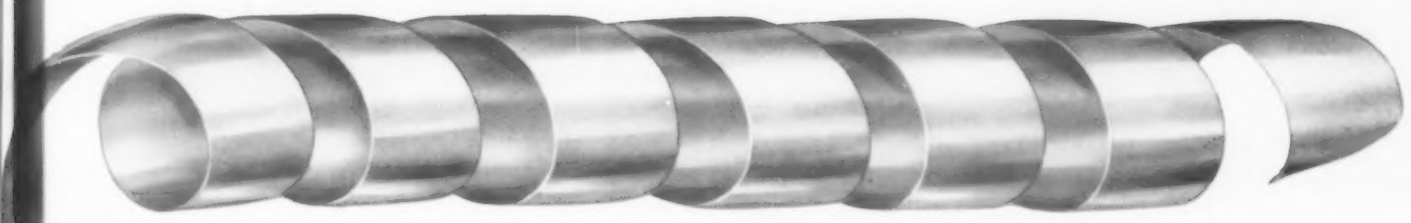
No. 1895

No. 1896

No. 1897

No. 1899

You Can CA$H These Chips



. . . because

They Can't Clog the Flutes

of MORSE Hi-Helix END MILLS

Yes, chips like these have a definite cash value to endmill users. For the shear-cutting action of the exclusive Morse Hi-Helix design curls up and rolls out the chips . . . easily, evenly . . . *without ever clogging the flutes.* So mill-life is longer. And cutting action is smoother, swifter, chatter-free . . . even on the toughest jobs.

On run-of-the-mill jobs, too, Morse delivers the same top performance. That's because Hi-Helix End Mills are properly undercut and ground with primary and secondary clearance. Then add Morse's specially heat-treated 18-4-1 High Speed Steel, and you have extreme toughness without any sacrifice of cutting ability.

So on any endmill problem, *"mark it for Morse,"* and ask your Industrial Supply Distributor.

And if your problems require Morse Engineering Service, remember that this service is always yours for the asking.

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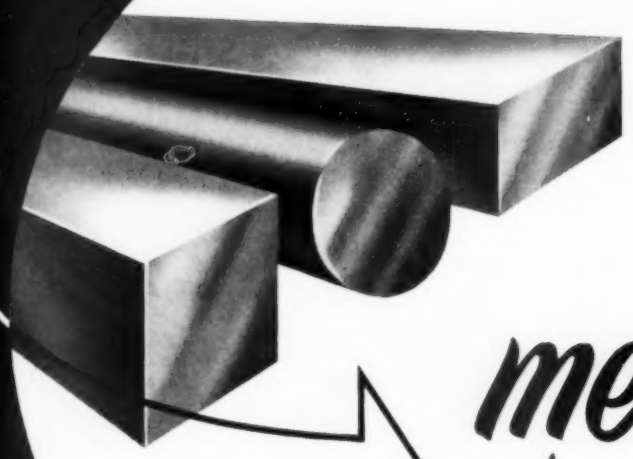

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Forging Die Design

By Waldemar Naujoks
GIRARD ASSOCIATES

FORGING DIE DESIGN conceives and develops the various working steps in the forging impression die, for use in forging equipment. Such forging tools may be the drop hammer, the forging machine, or the forging press, or a combination of two or more kinds of such forging tools. The primary purpose of the forging dies is to provide means for shaping forging stock, usually a short length of round, square, or flat stock, into the shape of the desired part. This is done by "flowing" the hot plastic metal in die cavities from an original bar or billet shape to the shape of the finished forging.

The design of forging impression dies requires a well-rounded knowledge of the action of hot plastic metal under forging pressure, and of the various means that are used to flow the metal along the path to obtain the finished forging. It is essential that no mechanical defects are developed, such as cold shuts, laps, unfilled sections, or ruptured fibre structure. In the case of highly stressed mechanical parts, such as aircraft fittings, positioning of the flow lines, commonly called grain flow, is of utmost importance, in order to obtain the maximum working strength and maximum resistance against part failure. In the succeeding discussion, some of the fundamental principles of forging die design will be discussed. Die sinking procedures will not be included unless a reference is needed to illustrate some particular point.

Flow of Plastic Metal

Briefly, the natural flow of hot plastic metal, when unrestricted in its movement and subjected to forging pressure, is to spread out equally in all directions, as shown in Fig. 1. It is also known that pieces being forged down tend to assume a greater spread outward between the top and bottom faces of the slug because of metal friction between die faces and slug faces and because the top and bottom faces of the slug cool more rapidly by contact with the relatively cold die. As a matter of fact, the bottom slug face shows less spreading than does the top slug face because there is constant contact with the bottom die and only intermittent contact in hammer forging. In press forging, the top and bottom die contact is equal.

It is evident that when a greater movement of metal flow is desired in one direction than in another, some type of obstruction must be placed at places where less metal movement is desired. Several standard methods are used to help shape the metal in order that the right amount of cross-section area is put in the forging stock throughout its length. Then the stock can be placed in the finishing impression or in the semi-finishing impression where the forging pressure will spread the stock to reach the impression sidewalls at the same time. Height of stock, while important, is secondary since the plastic metal must wedge against the sidewalls before it begins to move upward to fill upper die cavities.

The most commonly used device to proportion cross-section areas is the "edger", or edging impression, shown in Fig. 2. The "fuller", or fullering impression is used to reduce the section area in between the ends of the forging stock, as shown in Fig. 3.

Drawing is an operation used to reduce section area at one end of the forging stock, similar in its nature to the fuller but with only one end being worked down. By turning the forging stock 90 degrees between each forging blow, the several blows work down the section area.

The "bender", or bending operation, is a one blow operation designed to move various sections of the forging stock into a desired alignment for further forging in a succeeding die impression. Fig. 4 shows the bender and the resultant shape of the forging stock.

American forging practice has been to contain all of the forging steps in one set of forging dies, if possible, for use in the drop hammer. These dies are usually made of heat treated alloy steel, the particular grade of material and hardness depending upon the size and shape of the forging being produced. Impression dies for use in the forging press, may be contained in individual block, if desired, because of lesser impact vibration. Dies are usually fastened in the drop hammer with dovetail shanks on the dies, which are fastened to dovetail slots by long tapered keys, or wedges. Impression dies used in the forging machine or in the forging press are held in place by holding clamps.

Draft, or sidewall taper is necessary in drop forging dies to permit the removal of the forging from the die impressions. Normal draft around the outside perimeter is 7 degrees and around any inside tapers 10 degrees. The forging machine

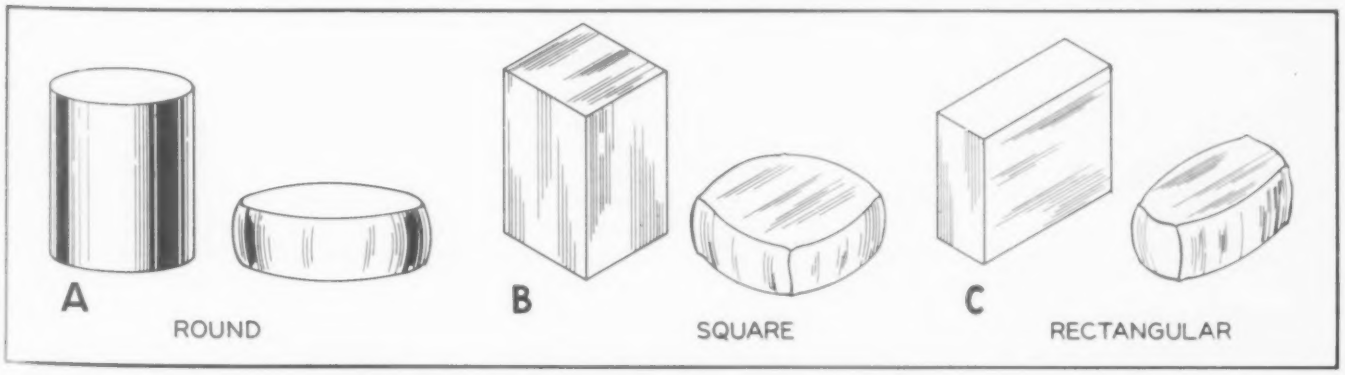


Fig. 1. These figures illustrate the tendency of metal flow when the metal is unrestricted. At A, a solid cylinder, in being forged down, moves outward equally in all directions to maintain its round diameter, if forged between flat dies without sidewalls. Part B illustrates the tendency of a square steel block, forged in the same manner, to become a round piece. Here the corners have a restricting effect, so that the metal away from the corners moves outward faster than the metal near the corners. A rectangular block, as seen at C tends to become an oval for the same reason.

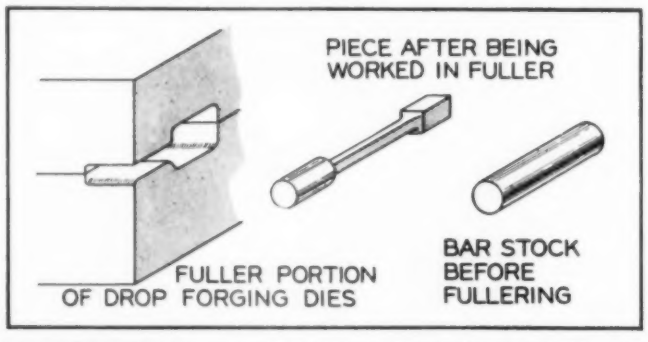
does not require draft for most applications, while the forging press may require some draft where no means of ejection are provided. The use of ejectors depends upon the particular application. Suitable radii are necessary for fillets and sharp corners. The size and shape of the forging naturally has considerable influence upon the forging die design, and other design considerations are the production quantities involved, the composition of the alloy being forged, the stress requirements of the part in service, and the type of forging tools available in the particular forging plant.

At the present time, drop forgings constitute the bulk of the impression die production forgings, and some of the preliminary forging steps in the drop hammer will be considered. Forgings for parts such as gear blanks where the piece is symmetrical around a center can be made without the use of preliminary die cavities. In some cases the forging stock can be placed directly into the finishing impression and forged to shape. In other cases, it may be desirable to strike a few flattening blows on space provided at one side of the finishing impression before the stock is placed in the finishing impression for further forging. Fig. 5 shows the steps in making a gear blank forging; Fig. 6 illustrates the use of the edger in forging a truck shackle.

A connection rod forging (Fig. 7) is a good example where the fuller is used to reduce a cross-section area in the portion of the stock that will be the I-beam section of the rod.

Forging Machine Dies

The forging machine may be pictured as a special double acting press operating in the horizontal plane. Its action is to grip round forging stock between a pair of dies and to push a suitable amount of exposed stock into the die cavity of that forging step. The gripping of the bar is done by machine action where the movable die block is moved against the stationary block with the round bar hole being slightly undersized to effect a good grip. This action is followed by a forward movement of the header slide containing the punches which push against the hot plastic stock, moving it into the die cavity. As in the production of drop forgings, the number of forging steps is dependent upon the shape and size of the given forging. Simple forgings may be made in one cycle of the forging machine while forgings of greater difficulty may require from two to five steps. The forging steps are usually termed "passes". Fig. 8 shows a typical set of forging machine dies.



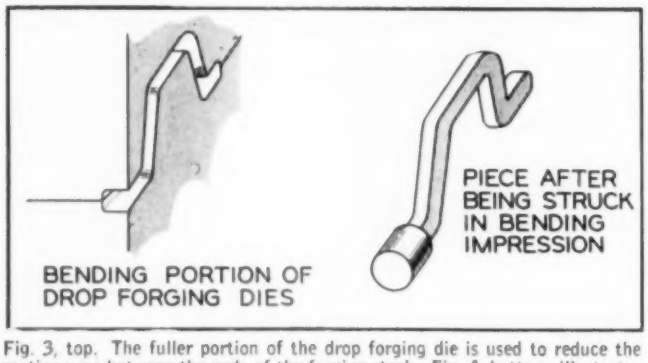


Fig. 3, top. The fuller portion of the drop forging die is used to reduce the section area between the ends of the forging stock. Fig. 4, bottom, illustrates the application of the bending portion of the die, and the resultant shape of the forging stock.

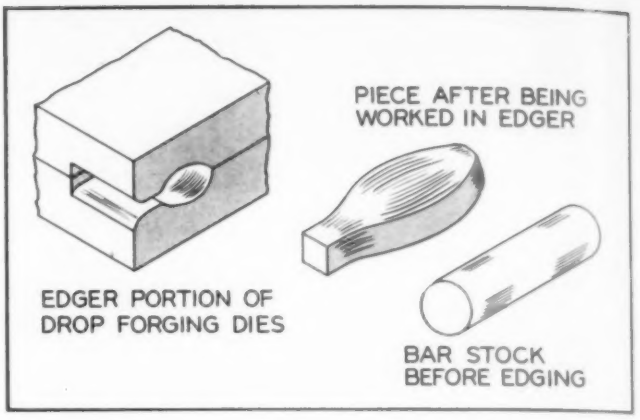


Fig. 2. The most commonly used device to proportion stock is the edger, shown above.

The forging press is used for large quantity production work in a manner similar to the drop hammer, the primary difference being that the forging press completes each step in one stroke of the press while the drop hammer may use several blows for each forging step. The forging press has not been used greatly on forgings where considerable fullering or edging is needed but new techniques are being developed where many of such forgings can be made desirable press forgings. One method has been to make forgings in pairs so placed in relation to each other that the need for fullering or edging is eliminated. Other ideas are making progress also.

The use of a combination of two different types of forging tools, such as the drop hammer and the forging machine, permits making of forgings not possible, or not economical, by one type of forging tool. Sometimes the size of the forging makes it necessary to divide the forging work between two or three forging units because it is not practical to contain the impression in one set of dies. As in all tool engineering designs, the factor of economy in production must be always considered along with the production techniques. Front axle forgings, large diesel connecting rods, and large crankshafts are examples of forgings requiring the use of two sets of forging dies.

Design of the forging dies is the primary consideration of the forging die designer, yet the design is not complete without developing tooling for subsequent process operations. Further processing may be only a set of trimming tools for removing the excess metal, or flash, which has squeezed out between the forging dies in the form of a thin plate. Further press operations, which may or may not be required are punching, which shears away a slug inside of the forging to open a hole; coining, where certain bosses or sections are squeezed to close dimensional tolerances; planishing, where diameters are struck several blows in the press to impart close tolerances and remove the flash lines; straightening or forming in a suitable press; sizing to impart a very smooth surface and fairly close tolerances; and marking where desired marks or designs are imprinted in the surface of the forging by the use of heavy press pressure. Such press operations may be performed cold, or it may be desirable to heat the forgings to a low dark red temperature, depending upon the given operation and upon the size, shape, and composition of the forging. At times, a drop hammer is used for restriking instead of a press.

The question of dimensional tolerances, and the amount of allowance for machining is one of high importance for the die designer. Naturally, the larger the permissible dimensional tolerances, the greater is the amount of die forging life, since impression dies are machined to the smallest per-

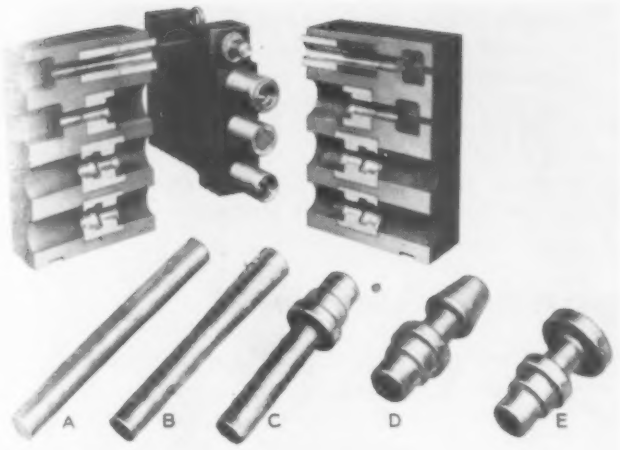


Fig. 5. The successive stages of forging a gear blank on an upsetter are shown here, along with the dies. At A is the stock, heated and cut to length. The bar is upset at one end in the upper die cavity at B, then in the next step (C) the same end is upset and formed to the finished shape of one end of the gear. At D the forging is gripped on the finished end, and the other end is upset in the bottom impression of the dies. The final shaping of this end of the gear is shown at E, where it is completed in the second impression from the bottom of the dies.

Fig. 6. Use of the edger in forging a truck shackle is shown in step 2, where the stock is flattened and gathered to provide sufficient metal to fill the die cavities which will form the main body of the shaft. Finished forging after trimming is shown in step 3. Other steps include: (1) Bar stock. (2) Blocking impression. (5) Finishing impression. (6) The flash after being trimmed from the forging.

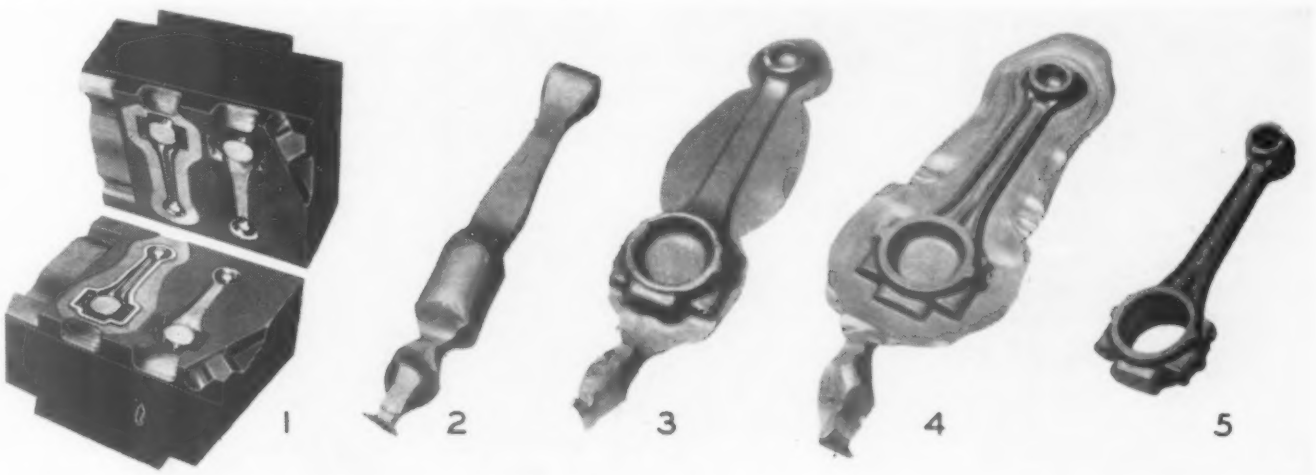
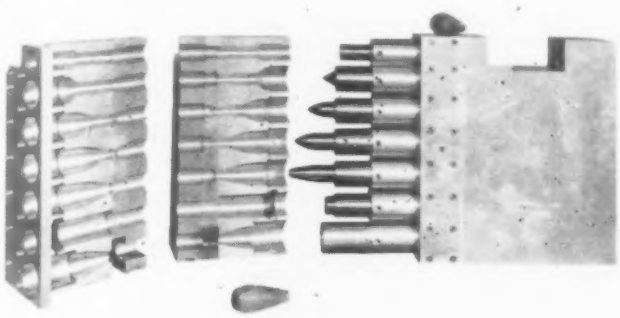


Fig. 7. The various stages in forging an automotive connecting rod—from dies to finished forging—are shown here. (1) shows the closed impression dies used to produce the forging. In step 2 edging and fullering operations are performed on the bar stock, and the first definite shape is imparted to the forging in step 3, the blocking impression. Step 4 illustrates the finished forging with flash still untrimmed, and in step 5 the finished forging is shown with flash removed and holes punched (done at the same time flash is trimmed).



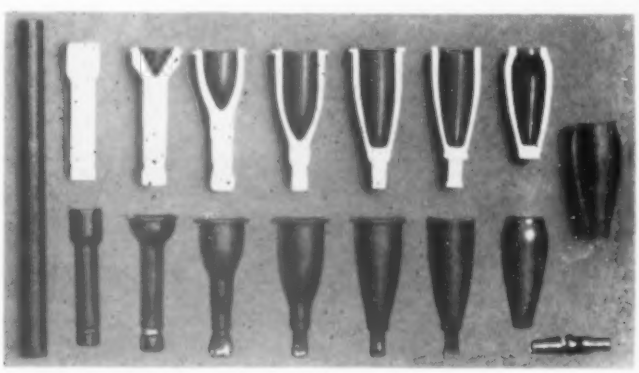


Fig. 8. A typical set of forging machine dies is shown at the right, which are used to produce the part shown in progressive manufacture at the left. By comparing the progressive development of the part with the top-to-bottom stations of the forging machine die an accurate correlation can be obtained.

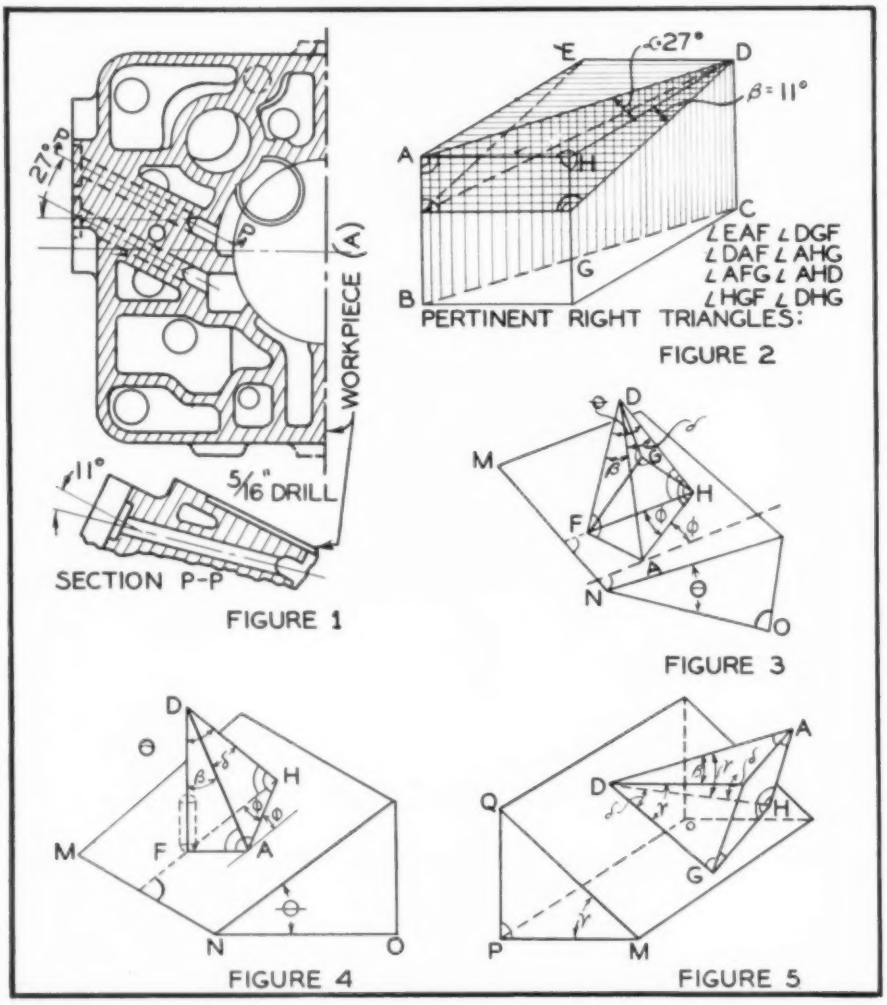
missible tolerances and continued production forging keeps increasing the size of the die impression. The amount of allowance for machining is not as exacting as it was some years ago, because of improved heavy duty machine tools which can remove greater amounts of metal than was possible previously. One of the frequent questions asked today is "How close can impression die forgings actually be held?" The answer is "They can be held to as close a tolerance as one is willing to pay for". Naturally, there is a point where it becomes more economical to remove metal by machining than to forge to a very close tolerance. Standard tolerances for impression die forgings are outlined in a Tolerance Booklet issued by the Drop Forging Association.

Normally, increasing the alloy content in steel compositions increases the resistance to plastic flow. Some shapes, in such an instance, do not need a change in technique, but require more forging blows or a larger forging unit. The more complicated shapes may require a change in the forging technique in forging metals of high resistance to plastic deformation. It is evident that such compositions tend to reduce the production life of the die impressions. Die hardness is, of course, a factor in die life, and thin flat forgings,

where the die impressions are very shallow, require dies of higher hardness than do the dies for forgings with deep pockets, large cavities, and holes. For die hardnesses up to about 400Bhn, the die blocks are machined in the hardened and tempered state, with the elimination of warpage, heat treating cracks, and change in sizes being of greater advantage than the increased difficulty in machining. Radii on corners and fillet radii are made as generous as the design will permit, to ease the flow of plastic metal in the die impressions and to increase impression die life.

Trimming die blades and punches, punchout punches, coining, dies, marking dies, and other auxiliary tooling are machined to shape and size in the annealed state and then hardened and tempered. Hardfacing is being used more extensively for trimmer blades and punches than in the past and its use has increased their production life considerably.

Drilling of Compound Angles



A workpiece frequently requires a hole to be drilled at an angle other than 90 deg, with respect to the surfaces of the workpiece. In such a case, if a double sine check is either unobtainable or not convenient to use, the angles of hole or bushing inclination in a jig to be used can be readily calculated by solid triangulation.

Fig. 1 shows a job requiring a 27 deg inclination, α, of the drilled hole from from one plane, with β the desired inclination of the hole from a plane normal to the first plane.

General Solution

Step 1: In the solid shown in Fig. 1, pass plane ABCD at $\Delta\alpha = 27°$ from the vertical side of the solid. The required center line of the hole will lie in this plane.

Step 2: Pass plane DEFG at $\Delta\beta = 11°$ from the horizontal side of the solid. The intersection of planes ABCD and DEFG will define the center line of the required hole. This intersection is line DF.

Step 3: Take solid DAFGH Fig. 2 and place it on an angle plate (Fig. 3) in such a manner that the center line or drill hole DF will be perpendicular to a horizontal plane MNO. Then, $\Delta\theta$ is the angle of tilt, and $\Delta\Phi$ the angle of skew, of drill hole DF from the horizontal plane.

In order for line DF to be perpendicular to plane MNO, it must first lie in a plane perpendicular to plane MNO and to line MN. This plane must be visualized as being tilted about axis MN until line DF becomes perpendicular to plane MNO. A suitable plane, containing line DF, to place perpendicular to plane MNO and line MN, is plane DFH.

Placing plane DFH in such a position skews side AH through $\Delta\Phi$, which can be laid on the angle plate. The plane AFGH is tilted through a suitable $\Delta\theta$ to make plane DFH perpendicular to plane MNO.

Step 4: For final solution, consider only the solid DFHA, as shown in Fig. 4. Using the simple unity method, let DA = 1. Then:

$$AH = \sin\alpha;\quad FA = \tan\beta$$

and

$$\tan\Phi = \frac{FA}{AH} = \frac{\tan\beta}{\sin\alpha} = \tan\beta\,CSC\,\alpha$$

$$= \frac{0.194438}{0.45399} = 0.19438 \times 2.2027$$

$$= 0.42816$$

$$\Delta\Phi = 23°\ 10'\ 43''$$

Again let DA = 1. Then:

$$DF = \sec\beta;\quad DH = \cos\alpha$$

$$\text{and } \cos\theta = \frac{DH}{DF} = \frac{\cos\alpha}{\sec\beta} = \cos\alpha\ \cos\beta$$

$$= 0.89101 \times 0.98163$$

$$= 0.87464$$

$$\Delta\theta = 28°\ 59'\ 51''$$

Solution for Horizontal Drilling

If the solid from Fig. 3 were placed on an angle plate, so that the drilled hole line DF is horizontal, then $\Delta\gamma$ is the angle of tilt and $\Delta\delta$ the skew angle.

Place the triangulation solid on the angle plate as shown in Fig. 5. Since plane DFG is perpendicular to DHG, it is possible to turn the solid so that DG is parallel to PM, and by virtue of the proper angle γ, DF will be parallel to PM and plane PMN.

Then:

Let DA = unity.

$$\tan\delta = \frac{GH}{DH} = \frac{\tan\beta}{\cos\sigma} = \tan\beta\ \cos\sigma$$

$$\tan\gamma = \frac{FG}{DG} = \frac{\tan\sigma}{\sec\delta} = \tan\sigma\ \cos\delta$$

$$\tan\delta = \frac{\tan\ 11°}{\cos\ 27°} = \frac{.19438}{.89101} = 0.21815$$

$$\delta = 12°\ 18'$$

$$\tan\gamma = \tan 27° \times \cos 12°\ 18' =$$

$$.50953 \times .97705$$

$$= .49782$$

$$\gamma = 26°\ 28'$$

By A. E. Rylander

39-90010

Solvent Degreasing—A Production "Tool"

Safe and efficient, the solvent degreaser promotes "good housekeeping" in the shop

SOLVENT DEGREASING of metallic and other parts of non-porous materials, such as glass and plastics, warrants serious consideration on the part of tool engineers because of its broad economy and general safety. Advantages of the process include fast removal of grease and oil with clean operation; also, as the work leaves the machine warm and entirely dry, it is ready for immediate finishing, inspection or shipping. Furthermore, a degreasing system requires only nominal floor space as compared to other systems for cleaning.

Essentially a production "tool" and fundamentally simple the process employs three basic types of degreasers: Vapor, also known as vapor degreasing; immersion; and spray. Depending on the nature of the work to be cleaned and the degree of cleanliness required, any one of the three types, or any combination of the three, may be incorporated into one unit.

In addition to cleaning parts prior to assembly or inspection, the process is also used to prepare parts for such subsequent operations or processes as rustproofing, painting, anodizing, galvanizing and electro-plating. As further applications, solvents and equipment similar in principle are used to dry-finish metallic and other non-porous surfaces.

Operates by Distillation

In vapor degreasing, the degreaser itself is a thermo-balanced open still to all practical purposes. Heat—steam, gas or electric—is applied to the bottom of the tank containing the solvent, and the vapors thus generated rise to a closely predetermined level. This level is controlled by means of a condensing coil located some distance below the top of the cabinet, or within the confines of the freeboard, as it is called. The vapors thus condense at the desired level inside of the machine, and the solvent returns via troughs while the steam can be diverted or dissipated as desired.

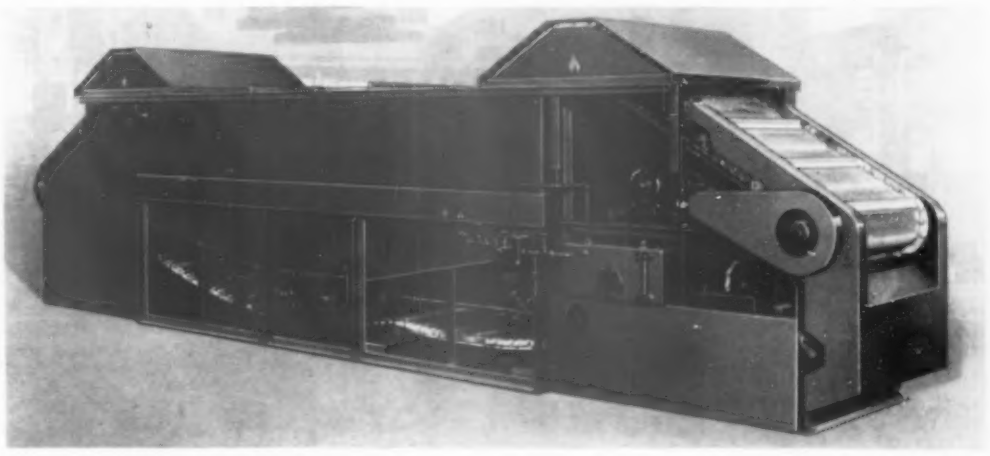
In this connection, it may be stated that the solvent vapor in the degreaser is in contact with the open air, which is in motion. Moisture in the air may therefore be transferred to the solvent vapor at the interfacial layer; also, there may be moisture in the parts being cleaned. This forms the "steam" referred to above, and this must be removed by a water separator which, in most cases, is furnished with the machine.

In solvent-vapor degreasing, the work is suspended in or passed through the vapors of the solvent which, for the general run of work, is non-inflammable. As the work is colder than the vapor, on entering the machine, the vapor rapidly condenses and as rapidly runs off as liquid, carrying the coating compound with it. As a result of the distillation, only pure solvent touches the work, and the washed-off grease or oil is precipitated into the tank, to be later removed.

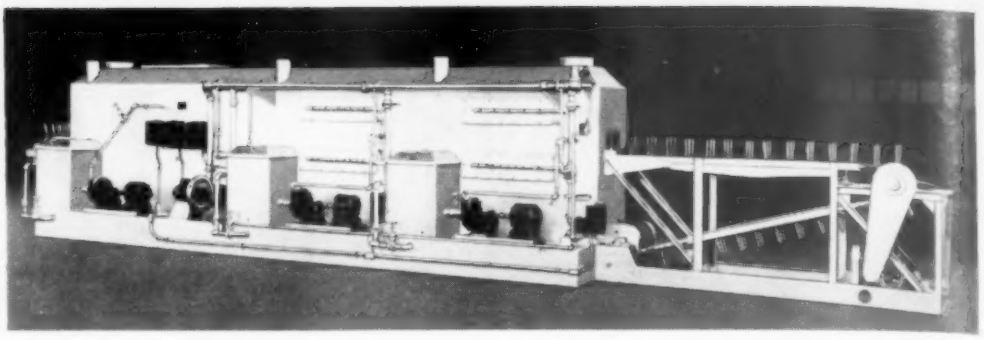
To elaborate, the work enters the machine cold; the vapor condenses on the work and is washed off; the parts become heated to vapor temperature on passing through the vapor level, and are rapidly dried by evaporation before leaving the machine. The process is continuous and therefore readily lends itself to conveyor handling and operation. The complete cleaning cycle usually requires but a minute or less.

As previously implied, the vapor stage is also used in combination with immersion in warm or boiling solvent, or spraying with warm solvent, as may be required by the shape and size of the parts and the nature of the coating compound. As a result, one may have any of the following cycles—or even occasional variations—for special conditions and applications: Vapor; vapor-spray-vapor; warm liquid-vapor; boiling liquid—warm liquid—vapor; and these in combination with spray. In some cases, inflammable liquids may be used, when adequate provision is made for safe operation.

The machines used vary in size according to the dimensions of the parts to be cleaned as well as according to production requirements. Maximum economy can only be achieved through the use of equipment having ample capacity. As suggested by the illustrations of typical equipment, the machines used range from comparatively small dip-type to large conveyor-equipped units. All types of machines, however, have certain characteristics in common.



A through-type vapor degreaser equipped with mesh belt for the fully automatic cleaning of metal parts. Note that the conveyor belt enters the degreaser above the vapor level and dips down so that the parts being cleaned ride through the vapor until they exit via the rise at the far end of the machine. With equipment of this type, parts to be cleaned may be hopper fed onto the belt conveyor or may be deposited on the conveyor directly from the production line conveyor. On leaving the degreaser, the parts may be deposited into tote boxes or directly onto another conveyor for transport to later operations. Photo by courtesy of Detrex Corporation, Detroit, Michigan.



A typical through-type alkali stripping machine. Work is placed on pins attached to the conveyor belt, which extends beyond the machine to provide an inspection table. This is a three-stage stripper used to remove paint from glass or metal surfaces prior to refinishing; however, it can be adapted to general cleaning operations. This is but one of many types of conveyor-equipped washing units, the most of which are engineered for the type of work which is to be cleaned, while not a vapor-degreasing machine, this unit suggests a conveyor system applicable to many degreasing machines. Photo: Detrex Corp., Detroit.

Recommendations for Selection

For one thing, good design would imply ample freeboard above the vapor level, and, according to maker recommendations, this should not be less than one half of the working width of the machine. For special installations, a greater height may be required in order to minimize escape of vapors due to movement of the surrounding air.

As additional requirements, sufficient heat input should be provided for so as to heat the maximum work-loads—racks and/or baskets included—in the required or specified time interval even under the most adverse conditions. Heat input must also meet any requirements for internal distillation and should further compensate for normal losses due to radiation, convection and other causes.

In this connection, there must be provided sufficient condensing surfaces, preferably around all four walls of the machine, to condense all solvent vapors that may be generated by the maximum heat input of the installation. This condensing surface—or at least a considerable part of it—should be an integral part of the walls so as to maintain a cool free-board and to prevent serious losses due to convection currents.

Good practice also calls for a suitable water separator to minimize the formation of mixed solvent-water vapors which, otherwise, would be lost into the atmosphere. This separator should be—and usually is—installed on degreasing machines having an open surface area in excess of 500 square inches.

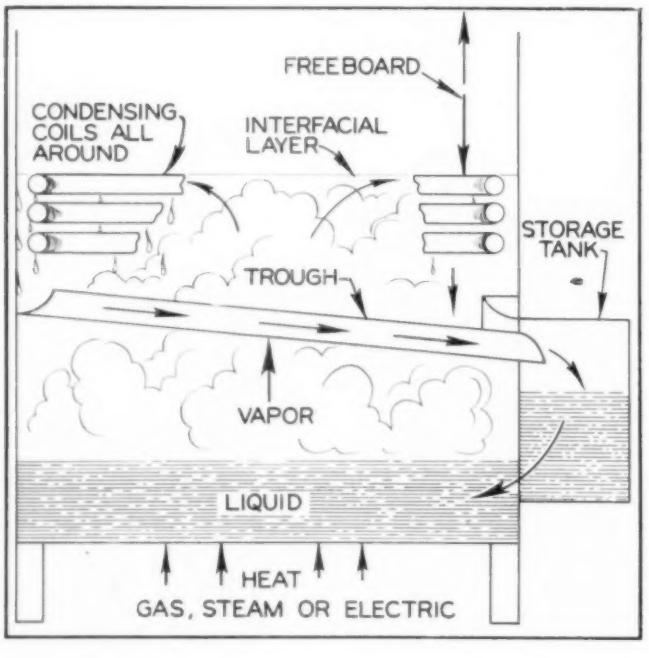
One item, of considerable importance, is the design of racks and the coincidental method of racking. Racks and baskets should be as light and as small as possible consistent with requirements. In any event, the size of the racks or baskets should not too closely approach the size of the machine since this would produce a "piston" action tending to pump the vapor out of the machine.

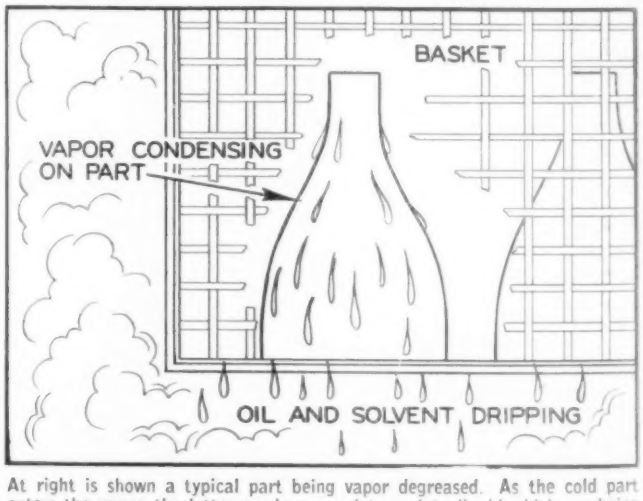
It is not implied, in the foregoing, that a user design and build his own degreasing equipment. Rather, since the manufacture of this equipment is more or less a specialty, the foregoing is a guide, based on maker recommendations, for selecting, installing and maintaining solvent degreasing equipment. And while not arbitrary in view of variables, the recommendations are nevertheless based on good practice as established by experience.

Because they are non-inflammable and combine high vapor weight with low specific heat, chlorinated solvents—also known as safety solvents—are used hot in metal degreasing. These solvents have been stabilized against breakdown due to heat, light, moisture, fatty acids and various non-ferrous metals. The stabilizers used are organic type soluble in the chlorinated solvent and volatilize with the solvent vapor during distillation. They remain soluble in the vapor and condense with it, thus stabilizing both the solvent and the condensate.

Despite the many advantages of vapor degreasing, the process has its limitations. For example, light-gage metal parts may absorb vapor heat so fast that condensation is arrested; also, air pockets may form in cup-shaped parts and thus exclude the vapors. Therefore—and due primarily to the fact that there is no mechanical washing action—the heavy soil may not be entirely removed.

In such cases, one turns to immersion degreasing, in which

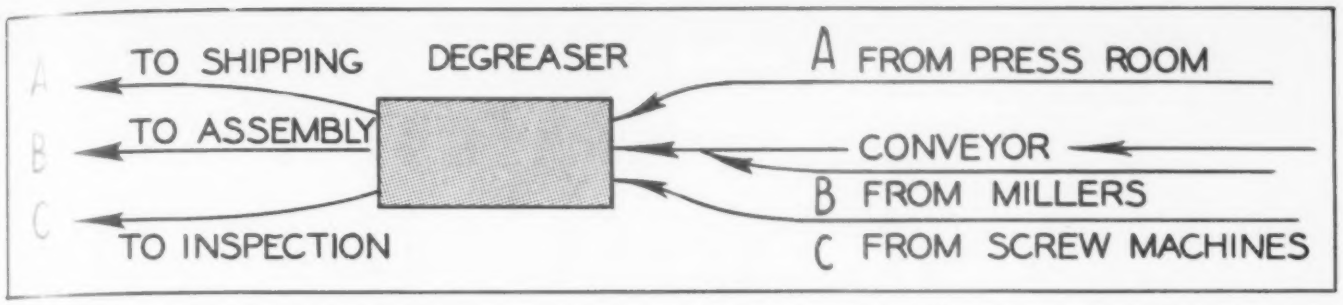




At right is shown a typical part being vapor degreased. As the cold part enters the vapor, the latter condenses and turns into liquid which, on being precipitated back into the tank, carries with it the oil or grease coating. The actual cleaning and subsequent drying takes but a minute or so per part or batch of parts.

At left, a sectional diagram of a vapor degreasing unit showing principle of operation. The solvent is heated by gas, steam or electricity, whichever is desired, and the vapor thus generated rises to a closely predetermined height controlled by water-cooled condensers on all four sides of the tank. As the vapor reliquefies as a result of condensation, it runs down the sides of the tank into a trough which returns it to the storage tank for recirculation. The cycle is continuous.

NOTE: Depth of liquid should be below bottom of storage tank to prevent back up of contaminated solvent in clean storage tank.



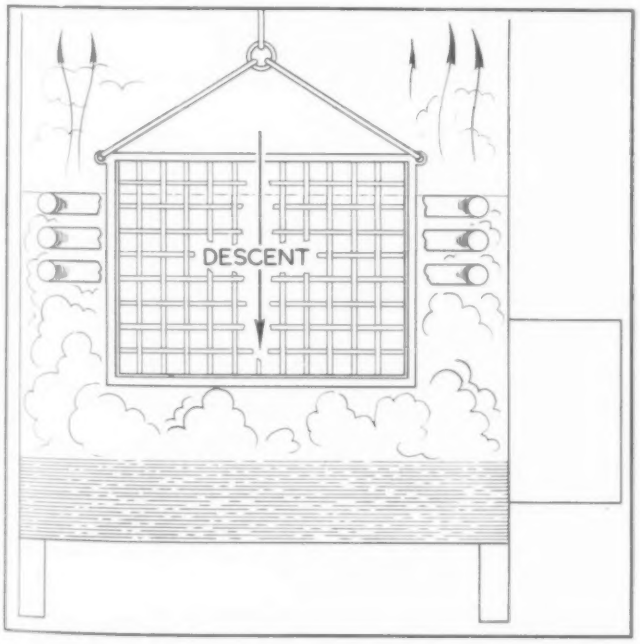
It is not necessary that parts to be cleaned be alike. Thus, screw products, pressed metal parts or other oil-filmed parts may converge to a feeder conveyor for delivery to the degreasing unit. There, they may be placed in separate baskets or racks, the contents of which may in turn be diverted to further processing, assembling, inspection or shipping as the nature of the parts may demand. A marked advantage of the process is the speed with which parts may be degreased and the "good housekeeping" afforded by clean operation.

the work is lowered into boiling solvent, where a more positive washing or scrubbing action is achieved by the continuous sweep of the boiling liquid. Machines for this type of degreasing may have two or three chambers—one for immersion into the boiling solvent, one to rinse with clean solvent, and a final chamber for pure vapor cleaning, plus space for drying.

Should immersion prove inadequate, then pressure spray cleaning is employed. This method is particularly applicable where small quantities of solvent are desired for cleaning large parts, it being less expensive to bring the solvent to the work than to immerse the work in a large volume of solvent. Incidentally, spraying provides the most positive method for removing caked-on material. In this phase of degreasing, the work is first wetted with solvent vapors, after which warm solvent is pressure sprayed on to mechanically remove solid particles. A final vapor rinse is used to remove all traces of oil or grease.

Materials Handling

In the final analysis, degreasing boils down to a work or materials handling problem involving plant layout on a lesser or greater scale, depending on quantity and the nature of the parts to be degreased. Where parts are small and quantities also small, dip-type machines can be used and installed along the production line or in a department, as circumstances dictate.



An important consideration, in vapor degreasing, is that the baskets or racks used to hold parts do not too closely approximate the inside dimensions of the tank. Too close a fit would cause a pumping or "piston" action as the basket is lowered and raised, tending to force the vapor out over the freeboard and into the open air, where it could be lost. For the same reason, vertical travel, into or out from the vapor, should not exceed about 11 ft. per minute, to avoid pumping. However, horizontal travel through the unit may be considerably faster provided that racks and baskets are not too wide.

However, the greater proportion of degreasing equipment is conveyorized for either semi-automatic or fully automatic operation, and this equipment lends itself admirably to the favored straight-line flow of materials handling—in fact, the average automatic degreaser would occupy little if any more space, laterally, than the conveyor line itself. Parts may therefore flow directly from the production line into the degreaser and thence to further finishing, inspection or shipping, as the case may be.

It is not necessary that parts to be cleaned be alike. For example, oil-filmed parts coming from various departments—screw products, pressed metal parts and others—may all converge to a feeder conveyor for delivery to the degreasing unit. Having passed through the degreaser, the various parts may be diverted into respective channels on leaving the unit, some going to inspection, some to assembly or further processing, as may be required.

Almost any of the conventional types of conveyors may be used, provided consideration is given to the type of parts to be cleaned. For example, the work may require special baskets or racks, some of which may have to rotate, and special fixtures as well as automatic pick-up and discharge devices. Each job must be analyzed on its particular merits or demerits.

The speed at which parts are degreased is an important consideration. For while about one minute will suffice for most work, actual travel—and especially through a vapor degreaser—should not normally exceed 11 ft. per minute vertically. This is because, while the speed can ordinarily be adapted to production requirements, material must not be introduced at a rate that would cause a pumping action and thereby lift the vapor above the freeboard, to be wasted into the air.

Fire Hazards Minimized

While chlorinated or "safety" solvents are ordinarily used for degreasing, certain types of work require petroleum spirits and emulsions for their cleaning. In such cases, safety precautions are incorporated into the design of the degreaser. These include an automatic safety door, which drops immediately should a fire occur in the cabinet; coincidentally, carbon dioxide is released by the sudden rise in temperature. With the cabinet thus closed off from the outside air, any fire that might start is promptly extinguished. As further precautions, dolly or conveyor wheels would be bronze, to reduce hazard of sparks, and motors are explosion-proof.

Whichever phase of solvent degreasing is used—vapor, immersion, spray or combinations of these—the fact remains that the process provides the advantages of thorough cleaning with speed and, in most instances, the ideal condition of straight-line flow of materials. It is safe, clean and efficient, and assures "good housekeeping" whether for small-lot runs of divers products or mass production of similar parts.

Contour Forming of Curved Parts

By Cyril J. Bath

PRESIDENT
THE CYRIL BATH COMPANY

MODERN STYLING CALLS for long sweeping curves, unusual contours and severe radii, all of which has created new problems for the tool engineer. Contour forming machines have helped to solve this problem—accurately and economically. By this method, formed sections produced on rolls or by extruding can be changed from straight line shapes into a variety of multiple contoured shapes.

The contour forming machine consists basically of a varispeed, power driven circular table and a double-acting, pressure-controlled cylinder. Forming is done either by stretch or compression methods, or both. The principal advantage of stretch forming is that the material being stretched approximates its elastic limit before forming begins, and springback is minimized. The material to be formed is secured in gripper heads mounted on the cylinder ram face and table, as shown in Fig. 1. Cylinder pull-stretches the material to approximately its elastic limit. In Fig. 2, the table has begun to revolve at a predetermined speed, laying the material on the form. Forming is completed by further revolution of the table, as shown in Fig. 3. Finished part is used for holding gas tanks in airplane wings.

If sharp curves are required, or the material to be formed is low tensile, soft steel, then compression forming is preferable. This forming is done on the same machines, except that the process is reversed. The main cylinder is locked parallel to the machine bed and pressure is directed forward toward the center of the table. The material to be formed is placed in position against the table mounted die. Shoes, rolls or tangent bars mounted on the shaper type ram force the material onto the die. While controlled force is exerted by the main cylinder, the table is revolved and material ironed onto the die. Compensation can usually be made in the dies to allow for springback. Fig. 5 shows an oval shaped body rail for trailers, formed by compression methods.

Fig. 1, shows the first step of stretching the metal to approximately its elastic limit.

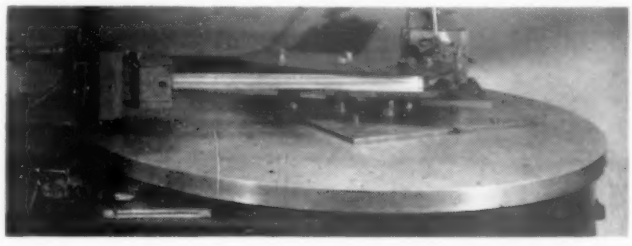
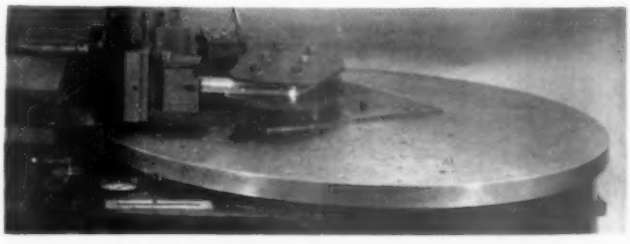


Fig. 2, after the material is stretched, the table begins to revolve, laying material on the die.



Forming is further completed by further revolution of the table in Fig. 3. Springback is held to a minimum.

Compound Shapes

In some cases a combination of stretch and compression is necessary, the former method taking care of long, sweeping curves, and severe corner radii formed by compression. The aluminum door frames for motor coaches shown above are examples of parts formed by both methods.

Contour forming methods can be used on almost any cross-sectional shapes. Fig. 4 shows 26 different shapes that have been formed successfully on this equipment. Parts are formed from bar, strip, sheet, tube, extrusions or rolled sections. Compound shapes such as bus front corners can be combined with other sections such as drip moldings at considerable economy, where such complex shapes can subsequently be curved. As to what material can be formed, the techniques are equally adaptable to the forming of carbon steel, stainless steel, aluminum, or ductile bronze. The ductility and elastic limit required in each case depends upon the sharpness of the curves desired.

Since parts are formed by line contact rather than on all surfaces at one time, a much greater variety of curves is obtainable by contour forming than by conventional methods. Spirals and even full circles can be formed, where the ductility of the metal permits. Reverse, compound or "S"

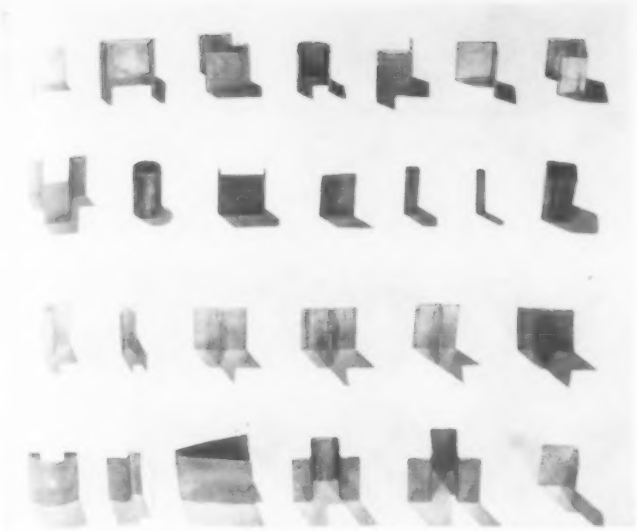
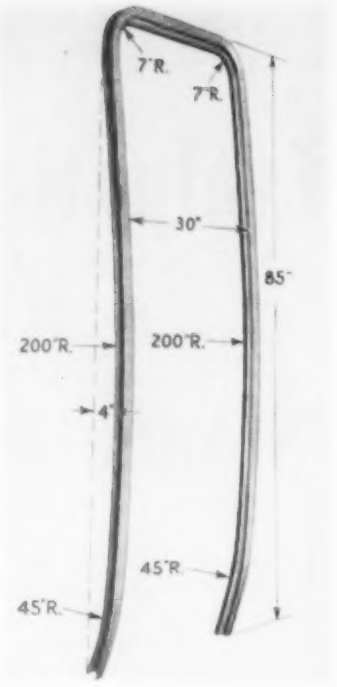


Fig. 4. Cross sections of typical structural shapes that have been successfully formed by contour forming methods.



(Left)—Fig. 5. The 7 in. radii in corners of this aluminum door frame are compression formed; all other forming done by stretch method.

bends are easily accomplished. Three dimensional forming can be done. In short, contour forming offers the engineer considerable freedom of design. Not only can more complicated forming be done, but parts can be formed in one piece to eliminate multiple joints.

Comparable Tolerances

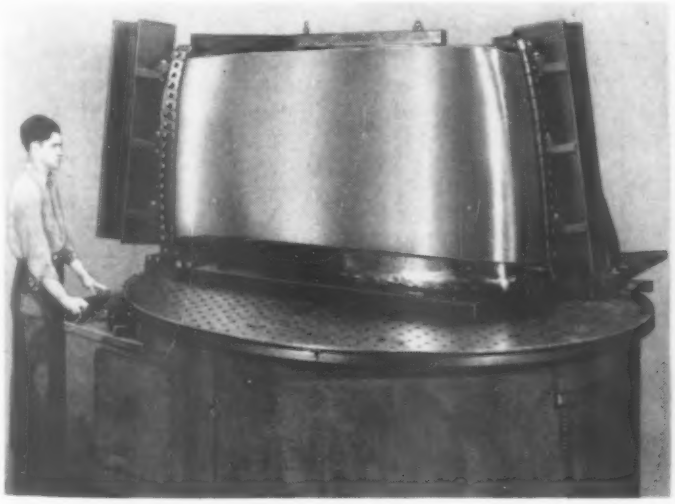
Since this process is still advancing in development, no definite charts or graphs of bends, thicknesses, springbacks, etc., are available to guide the designer. Variations in metals of the same grade preclude the assembling of precise data. Therefore, compensation for springback has been on a trial and error basis and only partially predictable from experience. The low cost dies, often made from Kirksite, Formite, Masonite or other easily worked material, permit inexpensive reworking to compensate, after a few trial pieces are formed. Tolerances are comparable to those common in press forming. In both stretch and compression forming, the outer fibers of the material are stretched and the inner fibers compressed. Where the material has a fairly high elasticity and the yield point is not exceeded, many materials are actually strengthened or work-hardened by stretch forming.

250° Radius

The shaping of fairly large complete sheets is also accomplished by contour forming methods. Conventional forming methods are limited to shaping parts to less than 180 deg in radius, whereas contour forming equipment can produce shapes to about 250 deg in radius. An excellent example of this type of work is the production of aircraft cowling, as illustrated in Fig. 6.

From the above descriptions, it should be clear to the designer that contour forming offers distinct advantages in metal forming, the most important of which are:

1. Contour forming will produce a variety of special shapes not formable by conventional methods.
2. Parts can be supplied as one piece instead of as separate sections, thus increasing strength, reducing weight and eliminating costly joining operations.
3. Flanged parts can be formed without wrinkling and there is no damage to polished metal surfaces.
4. Die cost is normally lower than for conventional methods.
5. Accurate part-to-part duplication, because springback is held to a minimum.
6. Advantage may be taken of complex cross section extrusion economies in fabrication.
7. Efficient for production requirements of 1,000 to 100,000 of any one part per year.



Stretch forming aluminum sheet for aircraft cowling is shown in Fig. 6. The process can be used to form radii to 250 deg.

Fig. 7, shows trailer body rail being removed from die after compression forming. Rolls mounted on the ram force material onto die.

By Clifford W. Kennedy

Evaluating Quality with the 'Standard Deviation'

IN THE MANUFACTURE of a certain type of fuel injector pump, the plungers or pistons used in the pump were to be ground to specifications of 1.6265 in., +0.0000, −0.0002 in. The job had been engineered, the recommended type of grinder and wheels had been ordered, and an official pilot lot of several hundred plungers had been run. A quick answer to the success or failure of the tooling and method of production was required, and sigma, the principle of standard deviation, was applied to the piston inspection.

To have wiped clean and accurately gaged the lot would have consumed an hour or so. Gaging a random sample of 20 pieces and calculating the standard deviation of the lot from specifications took not only less than a quarter of an hour's time but also gave, for all practical purposes, as comprehensive a report on machine and operation capability as the 100% detailing of the lot could have done.

The standard deviation of actual sizes from theoretical specifications was as follows:

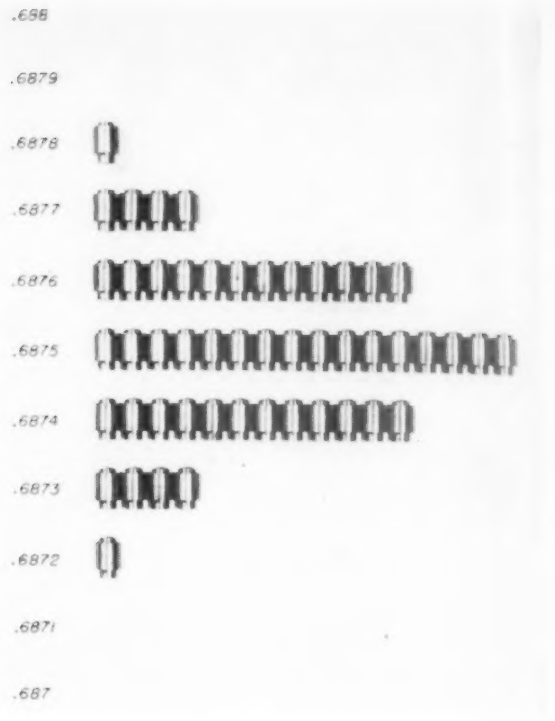
1.6268 in.	1.6267 in.	1.6265 in.	1.6264 in.	1.6265 in.
65	63	68	65	65
63	64	65	63	65
66	67	64	64	63

While this arithmetic necessary to calculate the standard deviation for this group of readings is explained in detail further on, we shall make immediate use of the answers obtained.

The results of the sample measurements and the calculation of the standard deviation showed that the entire lot of several hundred plungers contained a few pieces (probably 2 per cent) as large as 1.6270 in., and a similar number of undersized pieces down to 1.6260 in. Since the specifications called for all the work to be between 1.6263 in. and 1.6265 in., the assembly department would have to contend with plungers .0003 in. undersized and .0005 in. oversized. Some 40 per cent of the entire batch, the sample and sigma showed further, were on the high side, from .0001 in. to .0004 in. oversized. Not more than 5 per cent of the batch would be similarly undersized. An additional 55 per cent of the work was within specifications.

The most significant information offered by the calculation of the standard deviation, Sigma, was the fact that very probably the lot contained no work larger than 1.6270 in. (.0005 in. oversize) and none smaller than 1.6260 in. (.0003 in. undersize). Since there had been some discussion over the rather narrow specifications of 1.6263 in. - 1.6265 in., the knowledge of the limit of the amount and extent of out-of-tolerance work could have been important in deciding whether or not to accept the machine's output.

While the above has to do with the varying dimensions



A

among a batch of ground pieces, the use of sigma (or σ) is not confined to linear dimensions alone. It might apply to observations for hardness, amperage, viscosity, volume or for any characteristic the variations of which can in some manner be measured. The next thing to know then is how to calculate the standard deviation of a set of variables.

Computation of Sigma

Although the basic formula for sigma (σ) appears rather

Figure 1: Arithmetic for the "Standard Deviation".

O.D. Tolerance: 1.6265" +.0000 —.0002

Lot Size 500 Sample of 20

1.6268	1.6267	1.6265	1.6264	1.6265
65	63	68	65	65
63	64	65	63	65
66	67	64	64	63

X	$(X-\bar{X})$	$(X-\bar{X})^2$
8	3	9
5	0	0
3	−2	4
6	1	1
7	2	4
3	−2	4
4	−1	1
7	2	4
5	0	0
8	3	9
5	0	0
4	−1	1
4	−1	1
5	0	0
3	−2	4
4	−1	1
5	0	0
5	0	0
5	0	0
3	−2	4
20 99		20 47

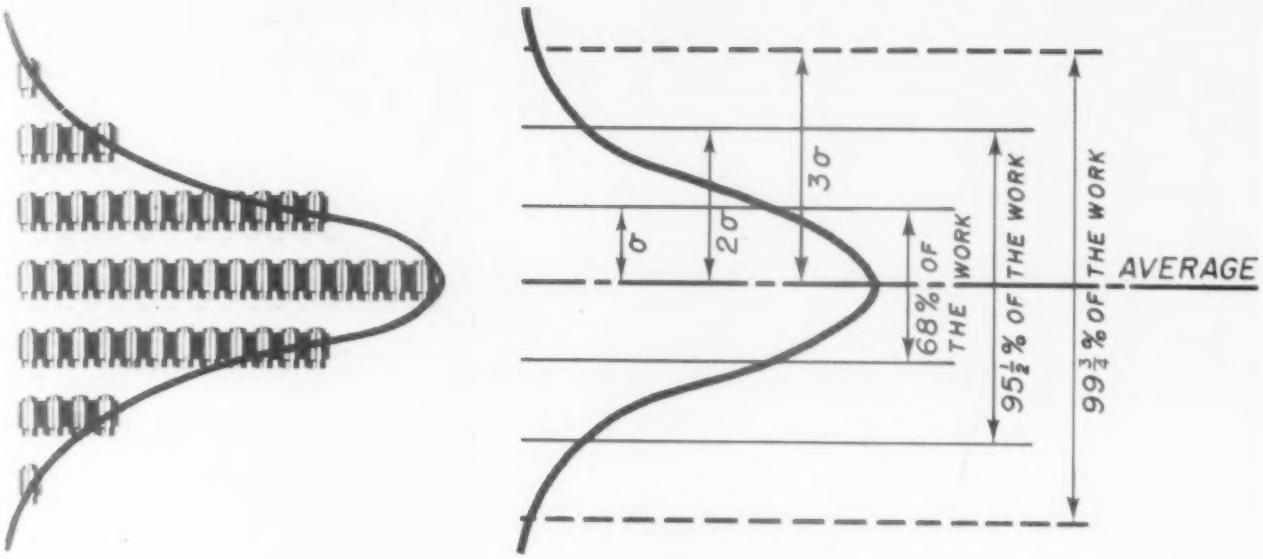
$\bar{X} = 4.9$

USE 5 AS $\bar{X}$

$\sigma = \sqrt{2.35}$

$= 1.53$

$3\sigma = 4.59$



B **C**

Figure 2. A, B, and C: The steps used in arriving at the Frequency Distribution Curve.

complex and unwieldy, the actual arithmetic can be made easy. The formula is:

$$\sigma = \sqrt{\frac{(X_1 - \bar{X})^2 + (X_2 - \bar{X})^2 \ldots + (X_n - \bar{X})^2}{n}},$$

where $\bar{X} = \frac{X_1 + X_2 \ldots + X_n}{n}$.

The barred x, $\bar{X}$, in the formulas denotes the average of a sample group of observations (variables) under consideration, and the terms X_1, $X_2 \ldots X_n$ mean of course the several observations or measurements used. Hence in using the formulas we get $\bar{X}$ by adding up all the observations and then divide that sum by the number of observations used in just the same manner we arrive at any average.

Next we subtract each observation *from* that average, as $X - \bar{X}$. Some of the readings or X's will be of course less than $\bar{X}$ and the result of some subtractions will bring minus quantities, but the signs can be ignored because the next step is to square each result of a subtraction, giving us each $(X - \bar{X})^2$ of the formula.

Add up the squared answers and divide by the total number of readings. Then take the square root of that quotient. The result is σ.

The actual arithmetic for obtaining a sigma can be further expedited by laying it out as shown in Fig. 1, which uses the set of oil injector plunger readings listed in a preceding paragraph.

In the first place, as Fig. 1 illustrates, we need use only the last digit of each observed dimension. Rather than handle a figure like 1.6268, for instance, we can use its last digit, 8.

In Fig. 1, in addition to the 20 actual measurements, variations among these readings are listed as a column of last digits under the letter X. With the X column of 20 figures written down, it takes only an instant to divide the sum of them by 20 to get the average of 4.9, as shown in Fig. 1 at the bottom of the X column.

In line with further arithmetic simplification, since 4.9 is near to 5, the figure 5 is arbitrarily used for the average of the X's, i. e. $\bar{X} = 5$.

The next column, Fig. 1, deals with the step of subtracting each observation from the average, resulting in the $(X - \bar{X})$ shown in the formula. In the $(X - \bar{X})$ column of Fig. 1 can be seen, therefore, the result of 8 minus 5 or 3, of 5 minus 5 or 0, of 3 minus 5 or -2, and so on down for the 20 readings.

The $(X - \bar{X})$'s are to be squared and that mental arithmetic process for twenty observations is detailed in the third column - under $(X - \bar{X})^2$ - of Fig. 1.

Add up the third column, which totals 47; divide this figure by 20 (the number of observations) for 2.35. The square root of 2.35, as Fig. 1 shows, is 1.53, or σ.

The mathematician tells us now* that, having obtained a σ, we are apt to find a few pieces in the main batch as large as $+3\ \sigma$ above the average, or $\bar{X}$, and some perhaps as small as $-3\ \sigma$ below the average—but in all probability none larger or smaller. Practical experience in a large number of experiments plus everyday use of the standard deviation method have borne out this statement.

In our example, σ is 1.53. Therefore, $3\ \sigma$ is 4.59. The average or $\bar{X}$ is 5.

Remember that we used for our arithmetic only the last digits of the actual dimensions measured. Hence 5 stands for 1.6265 in. (actually .0005 in.) and the $3\ \sigma$, 4.59, means .000459 in. Suppose we call the latter figure .0005 in. Then 1.6265 in. + .0005 in. $(\bar{X} + 3\ \sigma)$ is 1.6267 in. And 1.6265 in. - .0005 in. $(\bar{X} - 3\ \sigma)$ is 1.6250 in. Q.E.D.

The use of sigma saved a midwestern truck manufacturer several hundred thousand dollars annually in drop forge dies. Periodically, ten forgings, from any press or die, are weighed and the variations in weight recorded, as, say, an "X" column. Then the average weight of the group, $\bar{X}$, is

*For those interested, more complete descriptions of the mathematics, philosophy and proof of the standard deviation method can be secured from such books as, Quality Control Methods, C. W. Kennedy, Prentice-Hall, New York; An Introduction to Industrial Statistics, Paul Peach, Broughton Bros., Raleigh, N. C.; An Engineer's Manual of Statistical Methods, L. E. Simon, John Wiley & Sons, New York; Applied General Statistics, Croxton and Cowden, Prentice-Hall, New York; Industrial Statistics, H. A. Freeman, John Wiley & Sons, New York; Economic Control of Manufactured Products, W. A. Shewhart, D. Van Nostrand Inc., New York.

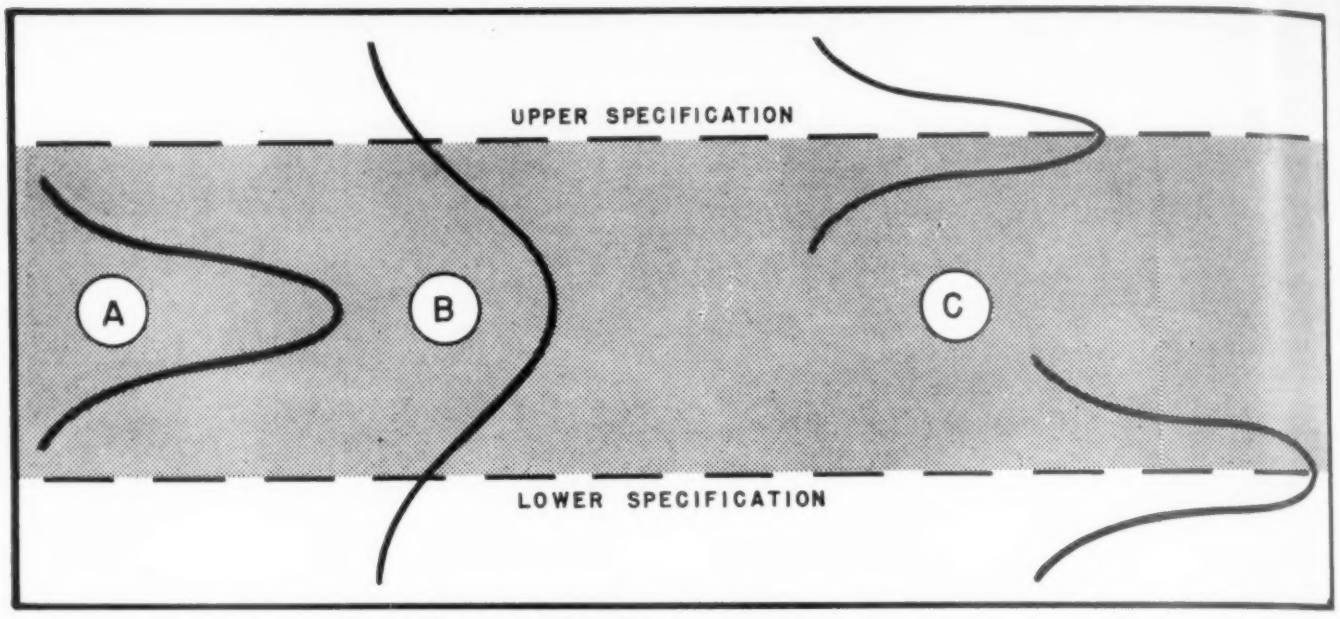


Figure 3: Frequency Distribution Curves in relation to specifications or tolerances.

secured and the $+3\ \sigma$ is calculated. As the die wears, the $\overline{X}$ goes higher and the $+3\ \sigma$ greater because as the forgings grow in weight from die wear, the flash in each forging increases, plus the body of the forging itself growing heavier, and the variation in succeeding 10 piece samples becomes greater. The remaining task was to correlate an upper limit for $\overline{X} + 3\ \sigma$ at which time a die could most profitably be taken out and dressed. Taking the die out more often than necessary was uneconomical from the standpoint of interrupted production. To permit a die to be used too long meant almost inevitably that it had to be thrown away and replaced with a new die because it was worn beyond economical repair.

Pattern of Variability

Statisticians demonstrate the pattern of variability and its measurement by means of the standard deviation with the type of curve illustrated at C in Fig. 2, a diagram known as a Frequency Distribution Curve. Any set of variables will cluster about its own axis, or average, in some such manner.

Another method is to consider the work of a machine, for example, where the O. D.'s have been measured individually and then classified by the actual parts measured placed in rows by dimension on a bench as shown in section A of Fig. 2. The outline of such a group suggests a curve as illustrated in section B of Fig. 2.

Furthermore, such a curve can be divided in six zones mathematically equal in width, three on one side—the plus side—of the average of $\overline{X}$ and three on the minus side. The calculated sigma—σ—is the weight of each of these zones or strips.

The mathematician also proved that 99-¾ per cent of all pieces making up a distribution defined by an average, $\overline{X}$, and the curve or pattern of their variability, will be contained within $+3\ \sigma$ limits as part C of Fig. 2 shows.

And finally, experience with this mathematical theory on everyday industrial processes has shown that, with few exceptions, the pattern or curve, the $\overline{X}$ and the σ of a sample will resemble the comparable pattern of the parent lot closely enough to form an accurate and satisfactory estimate of the conditions in the main batch.

At this point some stress should be placed on the term random sample. In taking a sample of work it is obvious that it should contain pieces from not only the first half hour of the run, say, but also the whole half day's work.

Fig. 3 shows several distribution curves or patterns with their $+3\ \sigma$ ($6\ \sigma$) limits in relation to specifications or tolerances. If the $6\ \sigma$ and the pattern of a sample come out in regard to tolerances as shown at A (Fig. 3), virtually no defective units reside in the parent batch, but if $6\ \sigma$ of the sample happens to limit a sample distribution pattern as illustrated at B in Fig. 3, the work produced by that operation is bound to contain defectives even though the operator has tried assiduously to hold on the specification mean.

Again, the $6\ \sigma$ and distribution pattern may be satisfactory, as at A, but the operator may be working either on the "high side" or the "low side." Part C of Fig. 3 illustrates the implied condition and indicates a situation common in machining where knowledge of the value of $\overline{X}$, the average, is necessary.

Manufacturer Applies Sigma to Bolts

One aircraft manufacturer has taken swift advantage of the ability of a sample and sigma, along with $\overline{X}$, to define the condition of a lot. His particular problem was making sure that all bolts, screws and studs he received from vendors were surely within certain pitch diameter tolerances, as per the class of fit desired and the National Screw Thread Specifications. Since many of the lots of bolts numbered ten thousand at a time, the job of 100 per cent gaging them to cull out possible defectives cost almost as much as the bolts themselves. Furthermore, if any appreciable percentage of out-of-tolerance bolts came along in any shipment, his 100 per cent inspection failed to discover them all and the risk of having loose or defective screws in his eventual assemblies was considerable.

He found that a sigma calculated from the pitch diameter measurements of a thoroughly random sample of 50 bolts rang the warning bell. If the $6\ \sigma$ ($+3\ \sigma$) of the sample exceeded the national standard pitch diameter tolerance, he rejected the entire shipment. What is most important to him, however, is the fact that when the $6\ \sigma$ of a sample is less than the specified tolerance spread, the tested shipment of bolts always proves more reliable at final assembly than any batch combed over by 100 per cent inspection. The cost of handling 50 random pieces, including the minute or two for a $6\ \sigma$ calculation, certainly compares favorably with the expense of a group of inspectors handling singly each of 10,000 bolts—and even then passing dangerous percentage of defective bolts.

By A. E. Rylander

Inspection with Ultrasonic Waves

Locating internal material flaws or bond failures with high frequency waves

INTERNAL FLAWS in materials, such as apparently minor defects that might eventually cause failures, may be detected and their location and extent determined by means of ultrasonic waves that resolve into a definite and readable pattern. This, however, is but one of many applications. Among other applications is the testing of materials for dimension, with the advantage that such dimensional checking may be done from one side only.

Thus, one may measure thickness of materials up to several inches in cross section, and may further detect and measure the depth of sub-surface flaws and inclusions. One may locate bond failures between laminar built-up materials having sound-conducting materials on the outside—as, for example, aluminum-balsa-aluminum panels—or between soldered, brazed or welded surface layers and backing material. The main consideration, in all cases, is that the test specimens have reasonably good sound-conducting properties.

While several concerns are currently manufacturing closely comparable systems incorporating the several elements or components involved, the systems produced by Sperry Products, Inc., and the Magnaflux Corporation—shown in Figs. 1, 2, 3 and 4—may be considered typical and are here used as subjects for discussion. While differing somewhat in detail, end purpose and mode of operation are substantially the same; therefore—with certain reservations—the two systems will be treated here as a composite system for inspection.

In general principle, the system may be linked to radar in that high frequency waves are directed at an object and reflected back to the source. As applied to inspection, the method employs a quartz crystal probe or "searching unit" which operates somewhat on the principle of a stethoscope but differs in that it both sends out and receives high frequency waves.

Passed over material under test, the probe transmits the ultrasonic sound waves through the material, or to the location of a defect, and the infinitismally brief interval of time between sending and return is shown as a pattern on a screen which provides visual indication of thickness or location of a defect, if any. The general principle is schematically shown in Fig. 5.

Sperry and Magnaflux Systems

The Sperry system is called the Reflectoscope, with the screen termed an "oscilloscope", and the Magnaflux system is known as the Sonizon—both rather pat designations in view of method of operation. Taking the Magnaflux system as an example, the screen—or Sonizon—scale is marked off directly in thickness on the fact of a cathode tube, and when the probe is held against the surface of an object, a sharp peak—or "pip"—immediately appears as a line across the tube. The location of the pip on the scale gives a direct reading said to be accurate within 1 to 2 per cent, whether for thickness of material or for sub-surface flaws.

The height of the pip is adjustable and has no particular bearing on the thickness of the material although, for the

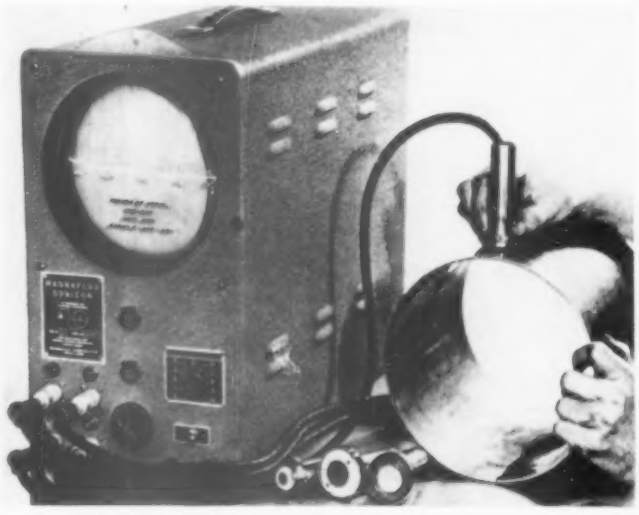
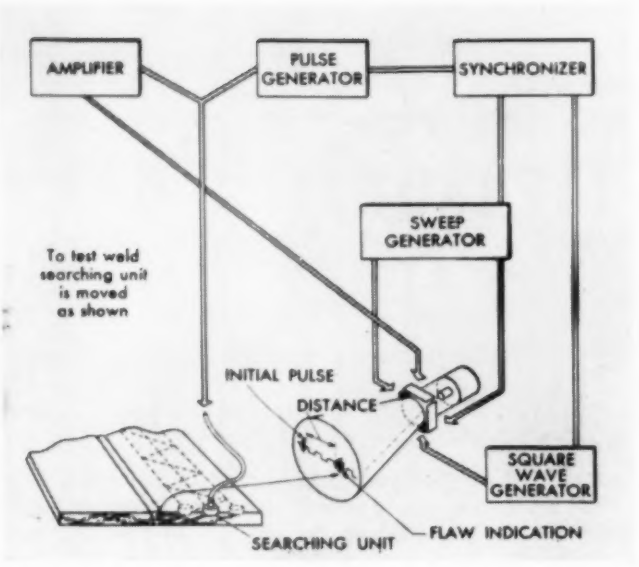
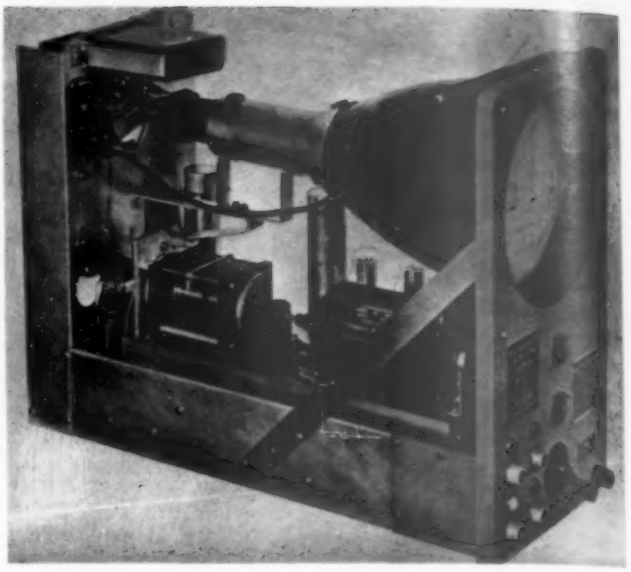


Fig. 1 at left, shows the Reflectoscope, by Sperry Products, Inc., Danbury, Conn. The searching unit—or probe, held in the inspector's hand—is being applied to testing of an arc weld. The screen of this unit is called the "oscilloscope" by Sperry. Shown in Fig. 2, at upper right, is the Sonizon, by Magnaflux Corporation of Chicago, Ill., here shown being applied to measuring wall thickness of pipe. In addition to the flat crystal probe, Magnaflux also provides a curved-face probe for insertion into small bores.





The diagram, Fig. 3 at left, and the photograph, Fig. 4 at right, show respectively the circuit and general components of the Sperry and Magnaflux systems, respectively. The former is shown being applied to testing of a weldment. Sound waves, sent out and received by the probe, are reflected back and appear as a pattern on the screen, for direct reading, as suggested by the "pips" in Fig. 2 and the lines on the screen in Fig 3.

thicker specimens, a number of harmonic peaks appear. In such cases two readings are taken, the thickness being determined by a comparatively simple calculation.

To describe operation more closely, a constantly changing range of high frequencies is fed to the crystal contained in the hand probe. These electrical impulses are changed to sound waves by the crystal and travel to the opposite side of the material—or to a defect—when they are reflected back to the crystal. When particular sound waves hit the opposite side of a test specimen at the same instant that the next waves are leaving, a change in energy is reflected into the electronic circuits and amplified to cause the pip to appear as the correct thickness indication.

Thus, a thickness indication is obtained corresponding to the ultrasonic frequency which is resonant to the specimen under test. The instrument scale is laid out to read directly in thickness of the material under test, whether ferrous or non-ferrous, and has been determined by the following relationship.

$$\text{Thickness (in inches)} = \tfrac{1}{2} \times \frac{\text{Sound Velocity (in. per sec.)}}{\text{Frequency (cycles per second)}}$$

To amplify: When reading thickness between 0.400 in. and 4.000 in., as an example, readings of two of the many harmonic peaks are taken and the thickness calculated from their product and difference. For adjacent peaks the following should be used: $T = R1 \times R2/R2 - R1$

Where R1 is the lower reading and R2 is the higher.

For best results, as recommended by Magnaflux, readings should be made on harmonic peaks which are as far removed from each other as possible; then: $T = N \times R1 \times R2/R2\text{-}R1$

Where N is the number of spaces between peaks separating readings R1 and R2.

Testing Steel

For a specific illustration, refer to Fig. 6, in which the probe-shown in inset at lower right—is used to test a rectangular bar of steel. Here, the thickness is read as follows:

R1 = 0.055 in.; R2 = 0.076 in.; and N = 5.

0.076-0.055 = 0.021

$$T = 5 \times \frac{.055 \times .076}{.021} = 0.995$$

Thickness T being stated as 0.995 in., and the steel bar being actually 1 inch thick, the reading is therefore well within 1 per cent of the nominal thickness.

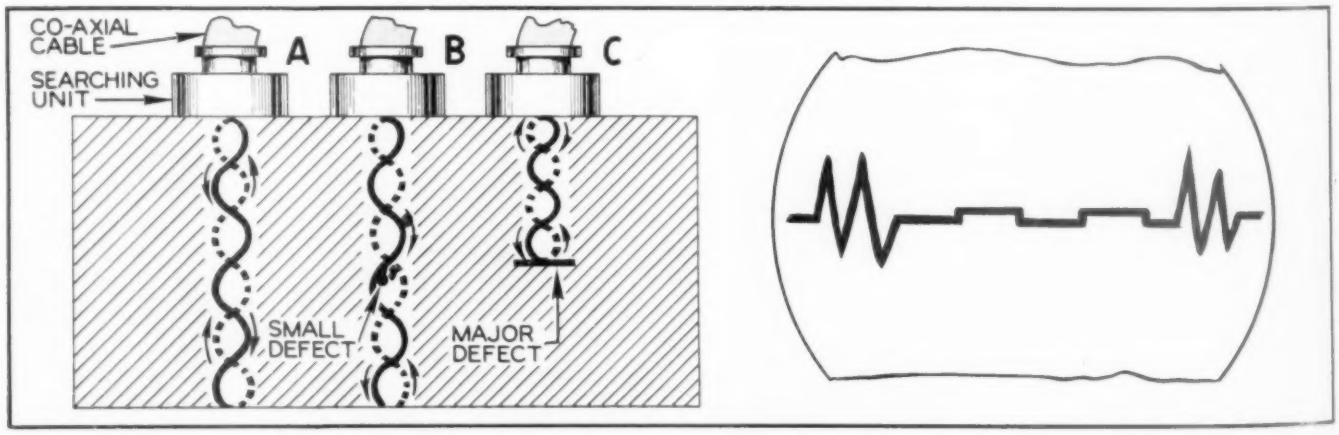


Fig. 5, a schemtatic diagram showing the essential "workings" of an ultrasonic inspection system. In operation, a constantly changing range of high frequency is fed to a quartz crystal in the searching unit. Changed to sound waves by the crystal, these electrical impulses travel to the opposite side of a test specimen and are reflected back to the crystal. When reflected waves arrive at the same instant that others are leaving, as shown by the solid and broken lines, an energy change is reflected into the electronic circuits, and amplified, to cause a "pip" to appear on the screen. The pattern will indicate the thickness of the material or, if the waves are intercepted by an inclusion, its location below surface will be indicated. At A in the illustration, ultrasonic waves are passing through and returning without interference. At B, some waves are intercepted by a small inclusion which nevertheless permits the rest to by-pass and return, and at C the waves are arrested by and reflected back from a major defect. The pattern shown on the screen has no relation to the test specimen; rather, is purely illustrative. Illustration by Courtesy of Sperry Products, Inc.

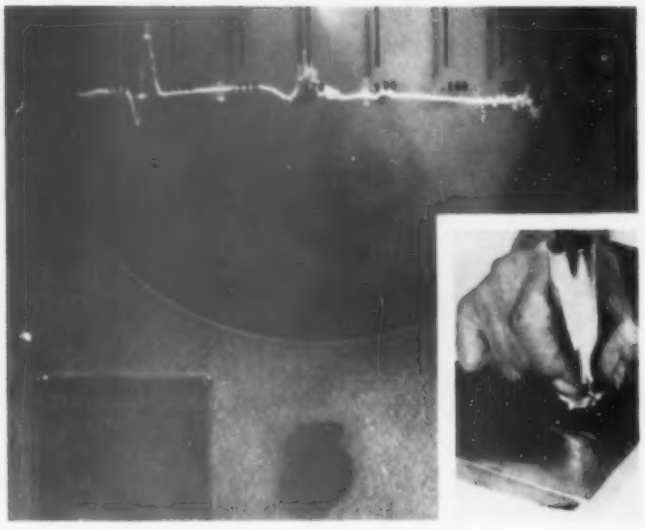


Fig. 6, at left, shows the Magnaflux Sonizon applied to measuring a rectangular bar of steel. Computed as described in the text, the scale shows the thickness to be 0.995 in., which is within 1% of the actual 1 inch thickness. When the probe is moved over the inclusion shown in the center of the bar, the pattern will change abruptly to indicate its location and extent. Fig. 7, at right, shows test on an alloy steel cutting tip welded to a mild backing. As shown, the bond is good and the reading indicates the combined thickness of tip and backing. Should the probe be passed over the site of a poor bond, the pattern will indicate the thickness of the tip only. Here, dimension is not important, the main consideration being to test for good bond.

When the searching unit is moved across the surface of the bar and over the inclusion, which is plainly discernible in the center, the reading will change abruptly to indicate its sub-surface location and approximate extent.

In cases where hard facing or high-alloy cutting material is brazed or welded to another material, such as mild steel, poor bond—or lack of bond—can be a serious consideration. Such a condition is shown in Fig. 7, where a high-alloy steel tip is welded to a mild steel backing to provide a tough cutting blade for severe industrial service. When the bond is good, as suggested in the illustration, the screen shows a total thickness reading for the entire blade—that is, for facing and backing.

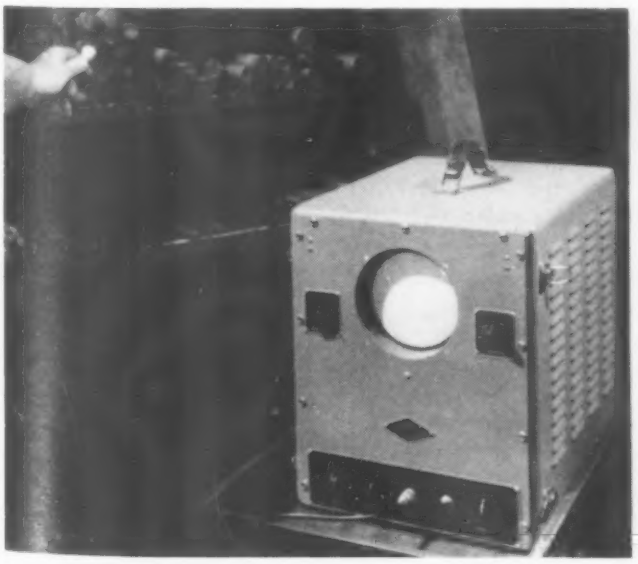
Should the bond be poor, however, the single thickness of the hard steel surface layer alone is read, in this case as 0.118 in. In cases of this nature, no reading is taken unless actually desired, the change of pattern being sufficient for recognition of flaws or inclusions in production testing of materials.

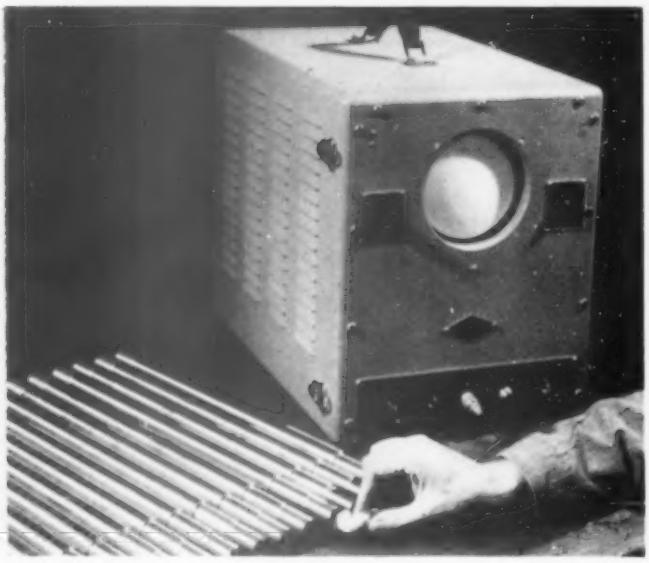
As another example, although not illustrated: Assume that the corners of a formed refrigerator cabinet are welded and that, after the bead is ground off, the curved surface is smoothed by hand grinding. Further assuming the original stock thickness to be 0.037 in., the problem here would be: How much wall is left after the grinding? For, if too much stock should be removed, the case may split as a result of imposed loads in shipment.

Production Inspection

Here, readings would be taken of the original stock thickness, after which any abnormal reductions in thickness can be ascertained by passing the probe over the surface. This is a typical problem as related to formed and ground metal products and suggests how tolerances can be established by comparison with a norm, after which periodic sampling tests will keep a process under control.

Among the many advantages of ultrasonic inspection is that inspection can be carried out at any point between receiving and stores of materials—castings, billets, bar stock—and final inspection before shipping, as suggested in Figs. 8 and 9. Thus, if material be sound on receipt, but should develop defects during processing, these may be located at the site of trouble and the part rejected before further manufacturing expense be incurred. In this connection, the system may be set up on the production line, as suggested





Ultrasonic inspection provides progressive checking of materials from receiving or stores through processing, as suggested in Figs. 8 and 9—left to right, above—to final inspection before shipping. The storekeeper is testing bars in storage for flaws before issue, while the line inspector is checking for flaws during process.

As suggested by Fig. 10, in which castings are being inspected as they pass along on a conveyor, ultrasonic inspection permits checking materials anywhere along the production line. Thus, parts that may be sound at the start of production, but which may develop defects during processing, may be eliminated at the site of trouble. Fig. 11, at right, shows how ultrasonic inspection may be applied to testing of wheels and axles of rolling stock. In such testing, the ultrasonic waves detect internal defects that would not respond to the "ring" of the checker's hammer but which might later cause serious failures. Illustrations by Courtesy of Sperry Products, Inc.

by Fig. 10, when parts may be tested as they move past on a conveyor.

Checking After Assembly

Of particular advantage is the fact that parts may be inspected from one side only. Thus, components of machine tools and other manufacturing equipment may be checked after assembly, without dismantling, or as periodic maintenance procedure. As a specific example, wheels and axles of railway coaches and locomotives may be tested for internal flaws not otherwise revealed by the "ring" of the checker's hammer until they had developed into serious surface cracks. Thus, as suggested by Fig. 11, science supersedes the human element in making our railroads safe.

The pattern of the Sperry system differs somewhat from that of the Magnaflux in that it is defined in definite sweep lines which may be adjusted so that each full wave represents any measure of distance from 1 inch to 2 feet. Fig. 12 illustrates a pattern, such as would appear on the Oscilloscope screen when testing a billet. A designates the initial impulse, B the zero sweep line with 1 inch mark waves, C the reflected vibration from a relatively large defect approximately 4 inches from the surface, and D is the reflected vibration from the other side of the billet, a distance of 8½ inches.

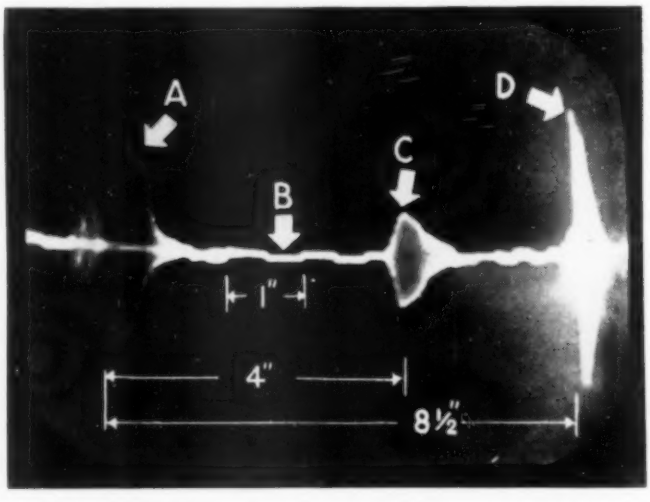


Fig. 12 The "pattern" on a Sperry "Oscilloscope" screen as it would appear when testing a billet. A shows the initial impulse, B the zero sweep lines, which are adjustable so that each full wave may represent any measure of distance from 1 inch to 2 feet, but here shown with 1 inch mark waves. C represents the reflected vibrations from a relatively large defect about 4 inches below the surface, and D the reflected vibration from the opposite side, a distance of 8½ inches.

Periodic Inspection

Entirely aside from the applications mentioned above, ultrasonic inspection is a portent for industrial safety. For example, one may subject to periodic inspection such items of equipment as storage or, pressure tanks, or boilers, whose shells may be eroded to the danger point as result of corrosive or erosive contents. In this connection, another application would be the testing, for wall thickness and possible defects, of long pipe lines that would otherwise have to be broken apart for inspection with conventional measuring instruments.

Yet other applications would be continuous testing of bars or strip, in which case the system would lend itself to automatically marking the location of a defect as it passes the probe and then—if so desired—stopping the machine in close proximity to the defect.

"SOUND AS A BELL"

Throughout centuries, or as long as man has been casting metals, these castings have been tested for internal flaws by striking them with a hammer. If the casting rang "clear as a bell" it was assumed to be sound; if "dead" then a flaw was suspected. With ultrasonic inspection nothing is assumed; rather one "sees" flaws even when they are buried well below the surface.

By . W. Lengbridge

34-92000

Draw Tools for Single-Action Presses

Installment No. 8 of a Series on the Theory and Practice of Pressing Aluminum

While closely coinciding with the tools used to form metal in double-action presses, draw tools for single-action presses —of which an excellent example is shown in Fig 73—nevertheless differ in design. They are classified according to the work done on the metal, as follows:

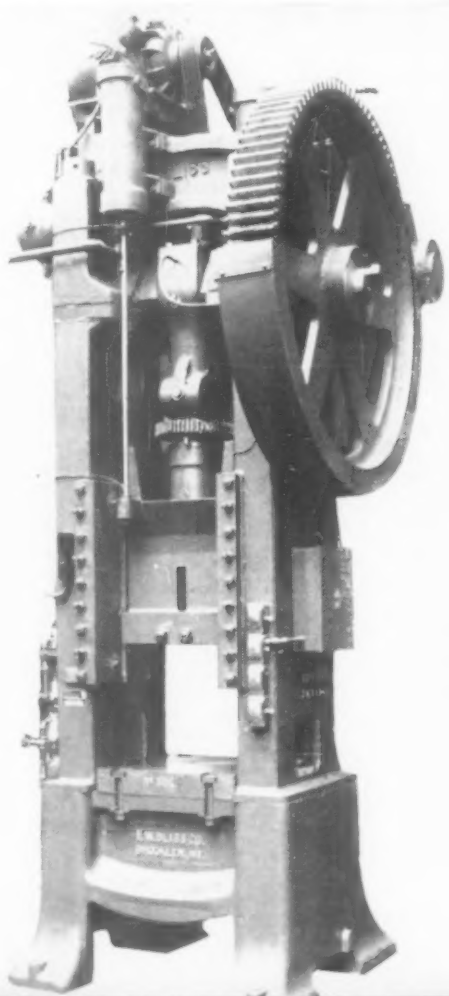
(1) Draw tools, in which the pre-cut blank is drawn to shape. See typical examples, Figs. 74 and 75. By comparing these tools with the draw tool for a double-action press shown in Fig. 56, preceding installment, the reader will the more readily understand why design of tools for double and single-action press equipment must be different.

(2) Blank-and-draw tools, as per example shown in Fig. 76, in which a blank is cut to size and drawn to shape in one operation.

(3) Multiple blank-and-draw tools—Fig. 77—in which a group of blank-and-draw tools are assembled into one unit so that two or more shells can be made at each stroke of the press.

(4) Progressive blank-and-draw, or blank-and-form tools, in which the work is progressively drawn or formed at a series of work stations, each of which performs a part of the total work. See Fig. 80. (5) Re-draw tools, of which an example is shown in Fig. 81, in which previously drawn shells are further reduced in diameter by redrawing.

Fig. 73. a typical single-action press. This tool has a 6 in. crankshaft and is rated at 135 tons at bottom of stroke. The frame is made up of four pieces—base, crown, and two side—held together by steel tie-rods shrunk in place. Bed area is 26 x 26 in. and stroke up to 12 in. Photo by courtesy of E. W. Bliss Company, Detroit, Mich.



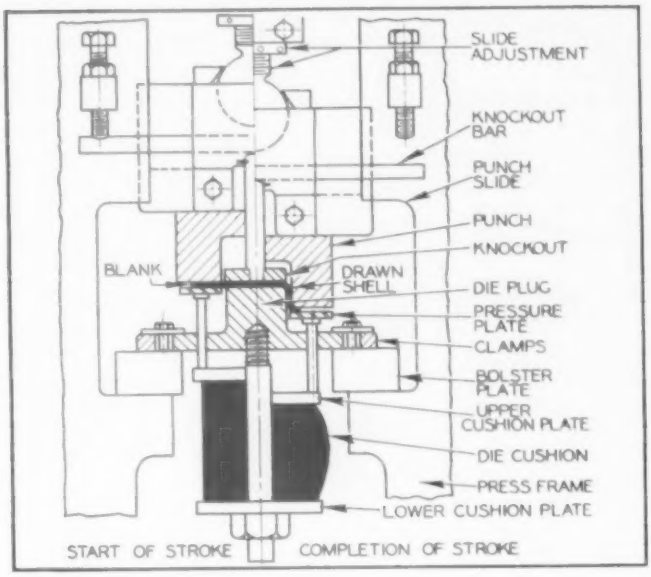


Fig. 74. A typical draw tool for a single-action press. The punch is clamped to the slide or ram of the press, and a knockout, fitted inside the punch pushes the shell out as the punch moves up. The upward travel of the knockout is arrested when the top of the knockout rod comes in contact with the knockout bar and, as the punch continues to move up to top stroke position, the shell is pushed out of the punch cavity. This operation is the direct reverse of that in a double-action press. The die is clamped to the bolster plate of the press, and a die cushion located under the bolster is used as a means of obtaining blankholding pressure. The pressure from the cushion is transmitted to the pressure plate by means of pressure pins. These pins should be large enough to withstand bending under the pressure, and should be ground to equal length in order to transmit uniform pressure all around.
In operation, the blank is placed on the pressure plate, the lower face of the punch grips the blank as the punch moves down and draws the metal over the stationary die plug. As the draw proceeds, the cushion—in this case rubber—is compressed and exerts an upward force on the pressure plate against the punch face. This prevents wrinkling of the metal between these two surfaces.

Design of tools for single-action presses may conform to any of the above five types, depending on such factors as size, quantity, accuracy and shape requirements. For example, large shells in small quantities may be satisfactorily made on a plain draw tool, whereas small shells in large quantities may be more economically produced from strip stock in a blank-and-draw tool. Multiple blank-and-draw tools are essential for long production runs where labor costs must be held low. However, this type of tool is mainly limited to small shells.

Draw Tools

Small cup-shaped articles requiring several draws can often be produced in one operation on a progressive tool, this lending itself to those products which can be drawn or formed in progressive stages. Since, however, the major differences of these several types of tools may be better understood from individual description and illustrations, we will discuss them in the order listed above.

In draw tools, which are preferred over blank-and-draw tools for large shells because of their lesser cost, the blanks to be drawn may be pre-cut to size by means of circle or

These articles are a collaboration between the author, Mr. Lengbridge, and Aluminum Laboratories, Ltd., of Kingston, Ontario.

corner shearing, or by other means. They are then located in a nest and drawn over a stationary die plug, as shown in Figs. 74 and 75, the latter typical of a tool for drawing a fairly large shell. Fundamentally, it is similar to a tool for drawing a small shell, differing only in construction details.

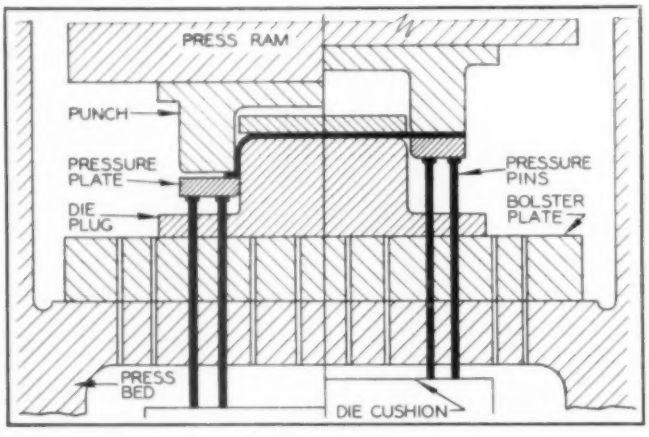
Blank-and-Draw Tools

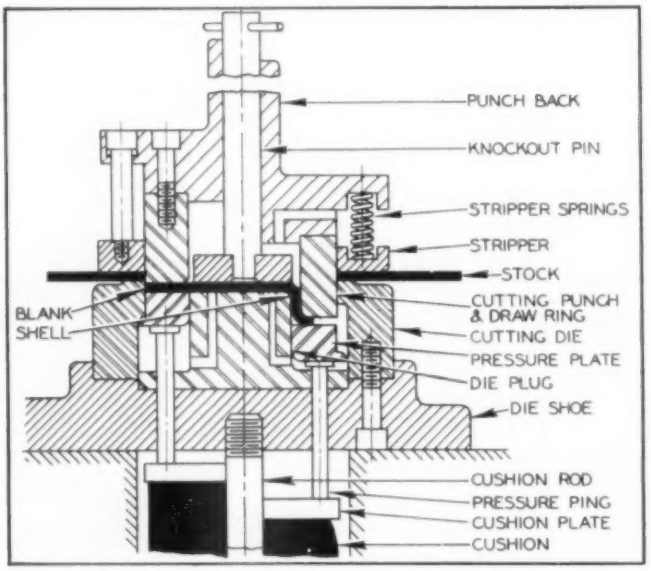
In blank-and-draw tools, the metal to be blanked and drawn is fed through guides across the top of the die, either manually or by roll feeds. A spring stripper on the punch prevents the stock from being carried up with the punch. The center die plug and cutting ring—the latter one of the items differentiating this tool from the draw tools shown in Figs. 74 and 75—should be carefully fitted, especially when drawing thin metals. The reason is that the punch ring performs a dual function; it cuts with its outer edge and draws with its inner edge.

While ordinarily made in one piece, the parts in which it works are usually two separate pieces—a cutting ring and a die plug. If these two pieces are not concentric, the cutting and drawing clearances will not be uniform and will result in burred edges on the blank and pinched walls on the shell. A satisfactory method of anchoring the cutting die and the die plug together, often used on tools for small shells, is indicated in Fig. 76. The base of the die plug is extended out so that the inside of the cutting ring can be anchored to it.

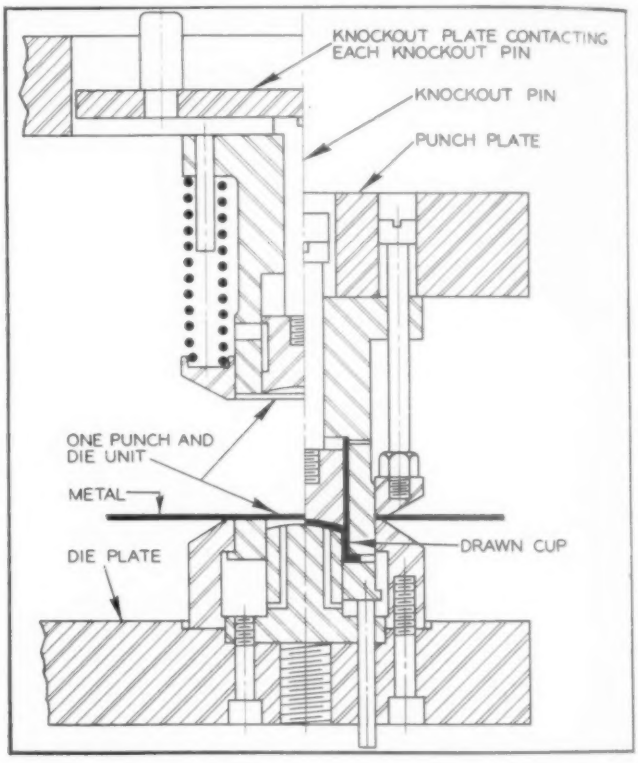
In cases where holes are required on the bottom of the shell, piercing may also be done on a blank-and-draw tool in the same operation. Piercing punches may be fitted inside the draw punch, and holes to suit these machined in the die plug. These punches should be of a length to pierce the shell just prior to the end of the stroke, thus performing three operations in one—that is, blanking, drawing, and piercing.

The tools shown in Figs. 75 and 76 are single tools producing one shell at each stroke of the press. In order to reduce labor costs to a minimum, it is often desirable to pro-





A single-action draw tool is shown in Fig. 75, upper illustration. Blankholding pressure is obtained from the die cushion, which is compressed as the draw proceeds. When the punch pressure is released, the cushion moves the pressure ring back to its initial position, thereby stripping the shell from the die plug. The shell is pushed out of the punch by the knockout as the punch moves up. This design is typical fo a tool required to draw a fairly large shell and, while construction details may differ for a tool for a small shell, they are fundamentally the same—that is, a punch containing a knockout; a die plug around which is the pressure ring; a set of pressure pins, the bottom of which rest on the die cushion and contact the pressure ring at the top. Fig. 76, lower illustration, shows a blank-and-draw tool for a single-action press. Note the similarity in design between this tool and the one shown in Fig. 74, the main difference being the addition of a cutting ring to the die and a stripper ring to the punch in order to make the tool perform both cutting and drawing. The outer edge of the draw punch is used to cut the blank to size at the beginning of the stroke. Guide pins—not shown here—are usually added to maintain correct alignment of the cutting edges.



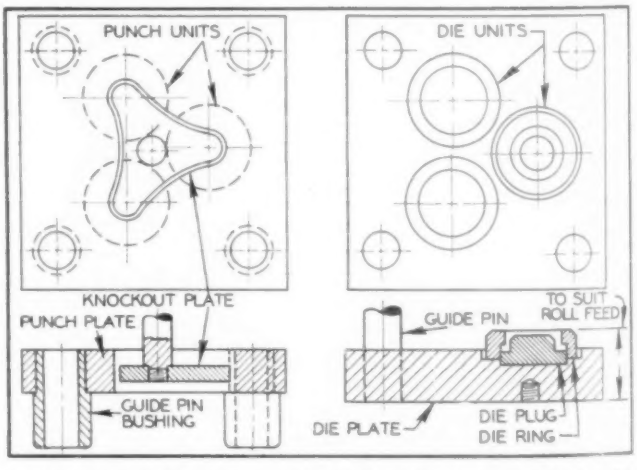
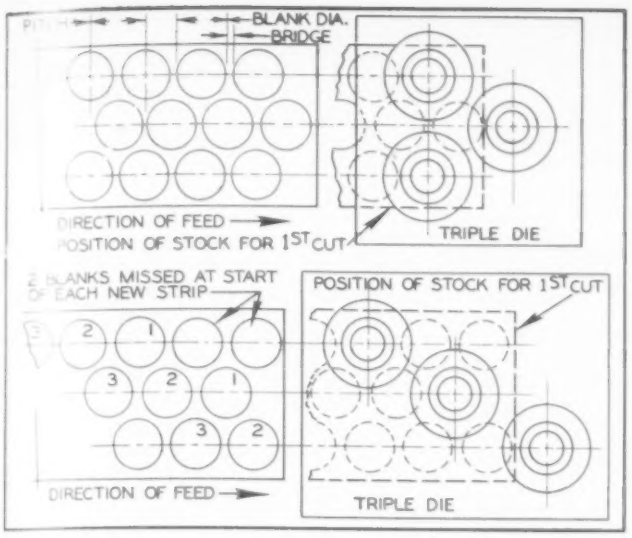
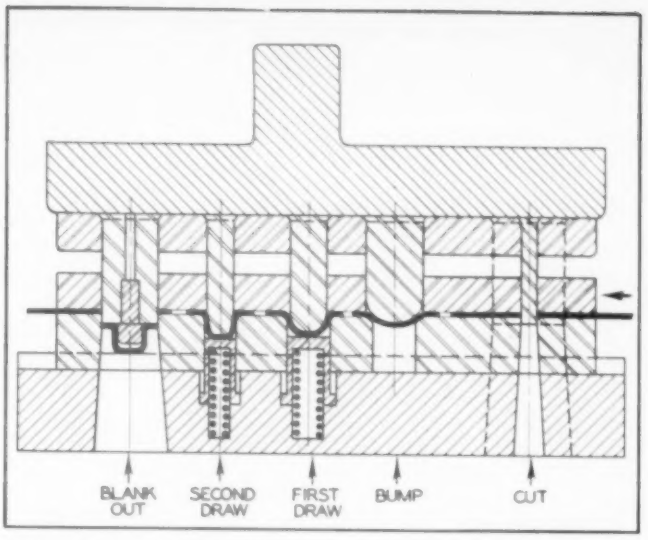


Fig. 77, upper illustration, shows a multiple blank-and-draw tool. This tool is similar in general design to that shown in Fig. 76, the main difference being in the knockout arrangement. Two or more units may be assembled to one die set, and each stroke of the press will produce two or more drawn shells. Each unit is usually fitted with its own die cushion so that it can be adjusted separately for blankholding pressure. In order to obtain positive knockout facilities on each unit of a multiple tool, the center rod must make contact with the knockout pad in each punch. This may be done by means of a plate attached to the bottom of the knockout rod, the plate being shaped so as to make contact with each punch unit. A method often used is shown in Fig. 78, lower illustration. The center of the punch plate is cut away, as shown in detail at lower left, and the three corners of a triangular plate extend to the center of the three units. The complete punch assembly is bolted to the press ram instead of being clamped on the center shank as in the case with single tools.





Arrangement of the units on a multiple tool must be such that the greatest stock economy is achieved. Feeds must be reasonably accurate in register, so that one group of blanked openings will not be overlapped by the next group. A typical stock layout for a triple tool is shown at A, Fig. 79, left illustration. When a new strip of stock is being started, it will be located so that the openings marked 1 are cut. The stock is then moved so that the three blanks marked 2 are cut, then three more at each stroke, and so on, thus obtaining the maximum number of blanks from each strip. Should the open die space through which the drawn shell is ejected be inadequate, the arrangement shown at A may cause trouble because one shell may strike the one in front when ejected by air blast. In such case the scheme shown at B offers some advantage in that each shell can be blown through without fouling another. However, this arrangement does not offer the stock economy of the design shown at A. For that reason it is not recommended for use when the material being drawn is in the form of short strips such as are commonly used for lithographed work. However, scheme B would be satisfactory when using coiled stock. Fig. 80, at right, shows a typical progressive tool—a 5-station tool performing the following operations: cut slot; bump; 1st. draws; 2nd. draw; and blank out the finished product. The stations are usually arranged in straight-line order, and strip or coil stock is fed across the top of the die. Small, deep cups can be made on this type of tool, but because of the complicated nature of progressive operations when combined in one tool, careful layout and equally careful workmanship is essential in its design and construction.

duce several shells per stroke. This may be done by assembling two or more blank-and-draw tools, all complete in each detail, on a common die set. This type of tool is known as a multiple blank-and-draw tool. A cross-section through one unit of this type of tool is shown in Fig. 77, with die set details shown in Fig. 78. This is similar in general design to the tool shown in Fig. 76, the only difference being in the arrangement of the knockout.

Multiple Blank-and-Draw Tools

These tools require greater accuracy in making and assembling than single tools owing to the fact that two or more complete tools must be in exact alignment and also located in correct relation with each other. Therefore, four guide pins are recommended for multiple tools, and the sliding fit on these pins should be close enough to maintain correct clearance on both the cutting and drawing members.

When blanking and drawing aluminum, a clearance equal to about 10% of the metal thickness is essential on both the cutting edges and drawing clearance in order to keep the parts correctly spaced. When blanking and drawing metal 0.010 in. in thickness, for instance, the clearance would be about 0.001 in., which means that the allowance for movement of the guide pin in its bushing should be 0.0005 in. or less. This degree of accuracy, in locating and fitting the guide pins and the operating parts of the tool, demands careful toolmaking.

When drawing on single-action presses, the shells are automatically stripped from the die plug by the pressure plate, which brings them up to a position convenient for removal. The high speed at which these presses operate necessitate quick removal, usually done by means of an air jet which blows the shell clear. On multiple dies, where two or several shells must be removed, it is often necessary to incline the press, as well, to make sure that all the shells are clear before the punches come down again. Poor venting arrangements will retard stripping, and thin-walled shells may be distorted because of the pressure necessary to strip them. A typical stock layout for a triple tool is shown in Fig. 79.

Such details as draw radii, clearance, venting and other elements of design, are discussed under draw tools, whether single or multiple. The fact that these tools produce quite small products, often from very thin metals, makes it essential to use considerable care and accuracy in their design and construction in order to achieve correctness of detail.

If the tools are carefully made from high-grade die steels, millions of satisfactory parts can be provided on a multiple tool at the rate of 5000 or more per hour. However, dies which are called upon to produce 2, 3, 6 or more identical pieces per stroke, at the rate of 80 to 150 strokes per minute, must be well made. There must be no "penny-wise" economies in either die material or workmanship.

Small shells, such as liquor or cosmetic caps or seals on which a design in lettering or color is required, are usually made on multiple tools because of the large quantities involved. The designs are lithographed on the sheet prior to the press operation. The paint or lacquer must not peel off or crack during the process of drawing; therefore, ultra-smooth drawing surfaces and uniform drawing clearances are "musts," as is careful handling of the stock before drawing and of the product after drawing.

The register of the stock-feeds for this kind of work must be extremely accurate, otherwise the designs or lettering may be out of place on the drawn shell. The lubricant used must not soften or otherwise spoil the coated finish, and must be capable of removal by evaporation rather than by cleaning. Lithographed shells are not made from coil stock because of the limitations of the lithographing and baking processes; therefore press feeds suitable for short strips are necessary.

Presses used for this class of work are special machines, single-action in principle but fitted with many intricate mechanisms to suit the use of short strips. The strips are automatically picked up from a stock of material and accurately fed across the die, the shells are blown through the back of the press, and the scrap automatically kicked off into a container at the side of the machine. The feed fingers which move the stock must be adjustable so that the stock movement can be arranged to suit different sizes of seals.

Progressive Tools

The progressive type of tool, of which a 5-station tool is shown in Fig. 80, is designed to perform different operations at several stations in such a manner that the work is drawn or formed progressively as the stock is moved from station to station. At the last station, a completed product is ejected.

corner shearing, or by other means. They are then located in a nest and drawn over a stationary die plug, as shown in Figs. 74 and 75, the latter typical of a tool for drawing a fairly large shell. Fundamentally, it is similar to a tool for drawing a small shell, differing only in construction details.

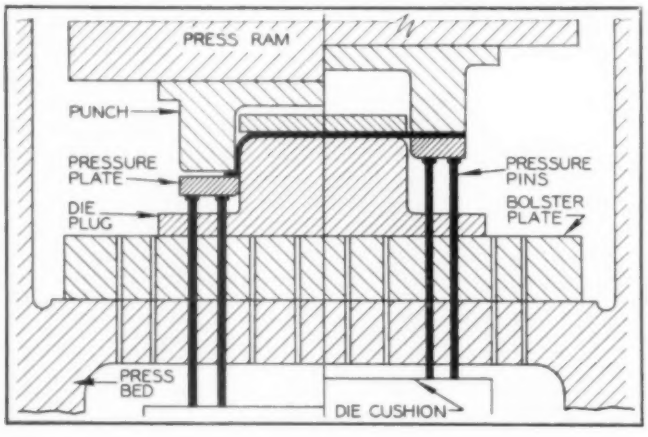
Blank-and-Draw Tools

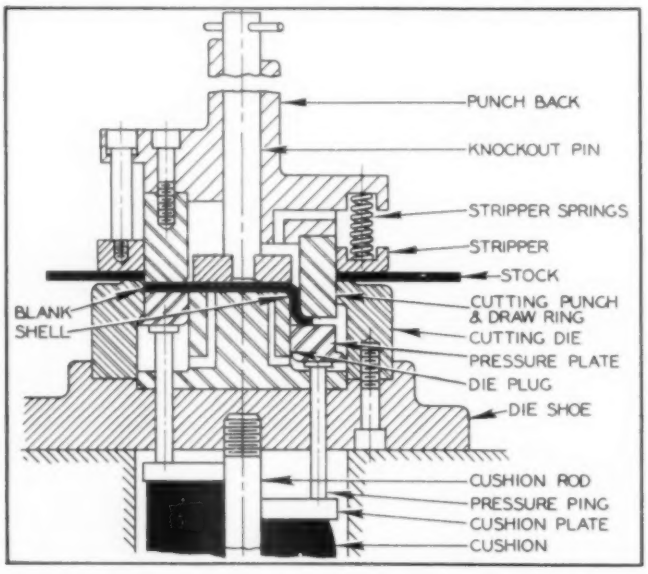
In blank-and-draw tools, the metal to be blanked and drawn is fed through guides across the top of the die, either manually or by roll feeds. A spring stripper on the punch prevents the stock from being carried up with the punch. The center die plug and cutting ring—the latter one of the items differentiating this tool from the draw tools shown in Figs. 74 and 75—should be carefully fitted, especially when drawing thin metals. The reason is that the punch ring performs a dual function; it cuts with its outer edge and draws with its inner edge.

While ordinarily made in one piece, the parts in which it works are usually two separate pieces—a cutting ring and a die plug. If these two pieces are not concentric, the cutting and drawing clearances will not be uniform and will result in burred edges on the blank and pinched walls on the shell. A satisfactory method of anchoring the cutting die and the die plug together, often used on tools for small shells, is indicated in Fig. 76. The base of the die plug is extended out so that the inside of the cutting ring can be anchored to it.

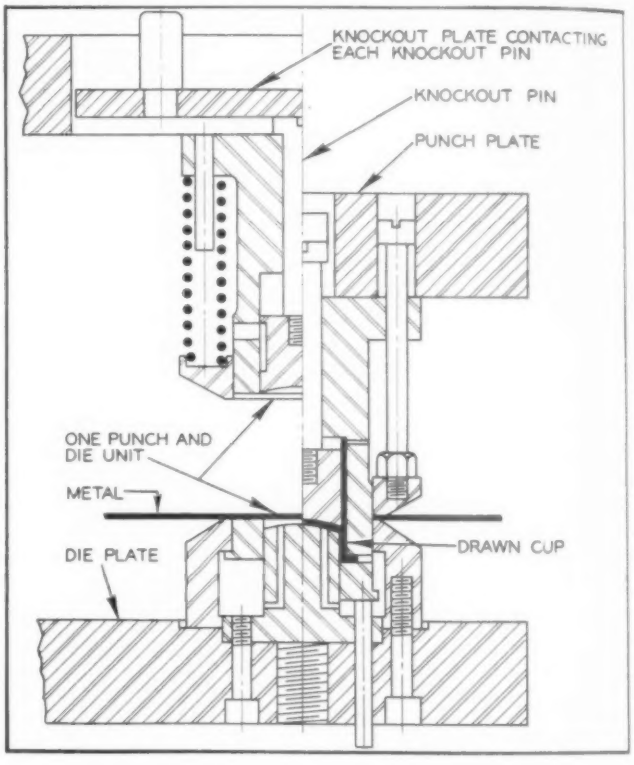
In cases where holes are required on the bottom of the shell, piercing may also be done on a blank-and-draw tool in the same operation. Piercing punches may be fitted inside the draw punch, and holes to suit these machined in the die plug. These punches should be of a length to pierce the shell just prior to the end of the stroke, thus performing three operations in one—that is, blanking, drawing, and piercing.

The tools shown in Figs. 75 and 76 are single tools producing one shell at each stroke of the press. In order to reduce labor costs to a minimum, it is often desirable to pro-





A single-action draw tool is shown in Fig. 75, upper illustration. Blankholding pressure is obtained from the die cushion, which is compressed as the draw proceeds. When the punch pressure is released, the cushion moves the pressure ring back to its initial position, thereby stripping the shell from the die plug. The shell is pushed out of the punch by the knockout as the punch moves up. This design is typical to a tool required to draw a fairly large shell and, while construction details may differ for a tool for a small shell, they are fundamentally the same—that is, a punch containing a knockout; a die plug around which is the pressure ring; a set of pressure pins, the bottom of which rest on the die cushion and contact the pressure ring at the top. Fig. 76, lower illustration, shows a blank-and-draw tool for a single-action press. Note the similarity in design between this tool and the one shown in Fig. 74, the main difference being the addition of a cutting ring to the die and a stripper ring to the punch in order to make the tool perform both cutting and drawing. The outer edge of the draw punch is used to cut the blank to size at the beginning of the stroke. Guide pins—not shown here—are usually added to maintain correct alignment of the cutting edges.



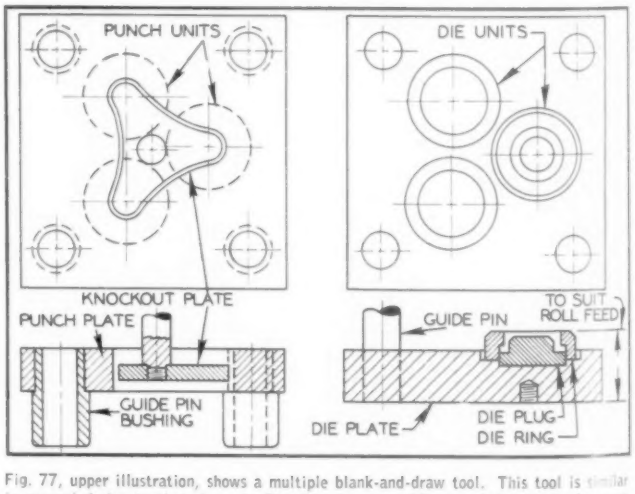
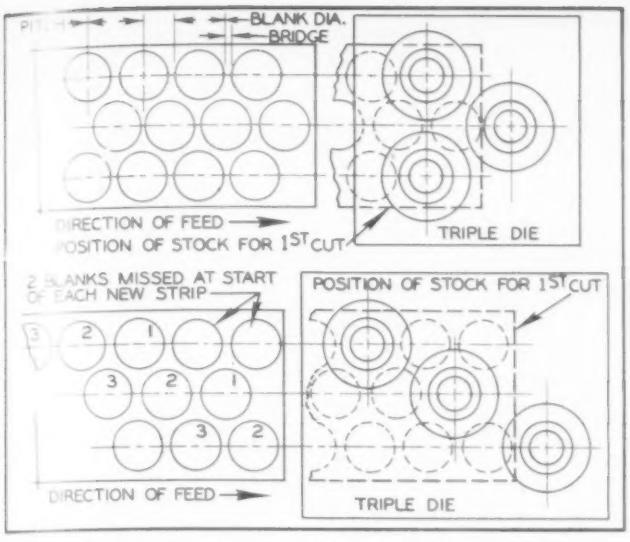
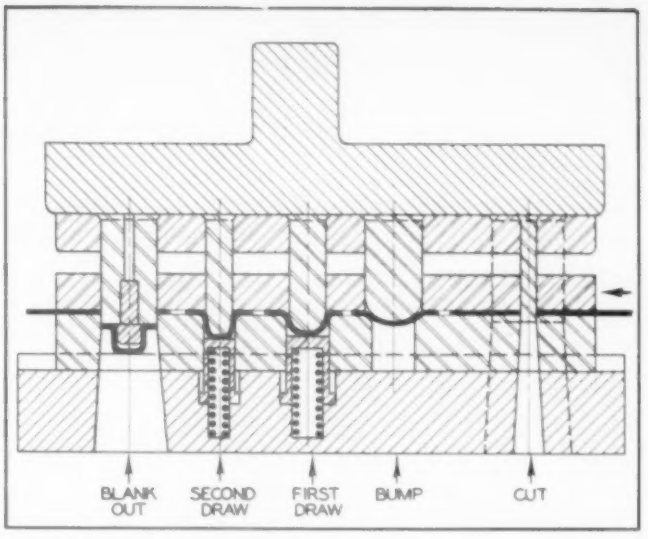


Fig. 77, upper illustration, shows a multiple blank-and-draw tool. This tool is similar in general design to that shown in Fig. 76, the main difference being in the knockout arrangement. Two or more units may be assembled to one die set, and each stroke of the press will produce two or more drawn shells. Each unit is usually fitted with its own die cushion so that it can be adjusted separately for blankholding pressure. In order to obtain positive knockout facilities on each unit of a multiple tool, the center rod must make contact with the knockout pad in each punch. This may be done by means of a plate attached to the bottom of the knockout rod, the plate being shaped so as to make contact with each punch unit. A method often used is shown in Fig. 78, lower illustration. The center of the punch plate is cut away, as shown in detail at lower left, and the three corners of a triangular plate extend to the center of the three units. The complete punch assembly is bolted to the press ram instead of being clamped on the center shank as in the case with single tools.





Arrangement of the units on a multiple tool must be such that the greatest stock economy is achieved. Feeds must be reasonably accurate in register, so that one group of blanked openings will not be overlapped by the next group. A typical stock layout for a triple tool is shown at A, Fig. 79, left illustration. When a new strip of stock is being started, it will be located so that the openings marked 1 are cut. The stock is then moved so that the three blanks marked 2 are cut, then three more at each stroke, and so on, thus obtaining the maximum number of blanks from each strip. Should the open die space through which the drawn shell is ejected be inadequate, the arrangement shown at A may cause trouble because one shell may strike the one in front when ejected by air blast. In such case the scheme shown at B offers some advantage in that each shell can be blown through without fouling another. However, this arrangement does not offer the stock economy of the design shown at A. For that reason it is not recommended for use when the material being drawn is in the form of short strips such as are commonly used for lithographed work. However, scheme B would be satisfactory when using coiled stock. Fig. 80, at right, shows a typical progressive tool—a 5-station tool performing the following operations: cut slot; bump; 1st. draws; 2nd. draw; and blank out the finished product. The stations are usually arranged in straight-line order, and strip or coil stock is fed across the top of the die. Small, deep cups can be made on this type of tool, but because of the complicated nature of progressive operations when combined in one tool, careful layout and equally careful workmanship is essential in its design and construction.

duce several shells per stroke. This may be done by assembling two or more blank-and-draw tools, all complete in each detail, on a common die set. This type of tool is known as a multiple blank-and-draw tool. A cross-section through one unit of this type of tool is shown in Fig. 77, with die set details shown in Fig. 78. This is similar in general design to the tool shown in Fig. 76, the only difference being in the arrangement of the knockout.

Multiple Blank-and-Draw Tools

These tools require greater accuracy in making and assembling than single tools owing to the fact that two or more complete tools must be in exact alignment and also located in correct relation with each other. Therefore, four guide pins are recommended for multiple tools, and the sliding fit on these pins should be close enough to maintain correct clearance on both the cutting and drawing members.

When blanking and drawing aluminum, a clearance equal to about 10% of the metal thickness is essential on both the cutting edges and drawing clearance in order to keep the parts correctly spaced. When blanking and drawing metal 0.010 in. in thickness, for instance, the clearance would be about 0.001 in., which means that the allowance for movement of the guide pin in its bushing should be 0.0005 in. or less. This degree of accuracy, in locating and fitting the guide pins and the operating parts of the tool, demands careful toolmaking.

When drawing on single-action presses, the shells are automatically stripped from the die plug by the pressure plate, which brings them up to a position convenient for removal. The high speed at which these presses operate necessitate quick removal, usually done by means of an air jet which blows the shell clear. On multiple dies, where two or several shells must be removed, it is often necessary to incline the press, as well, to make sure that all the shells are clear before the punches come down again. Poor venting arrangements will retard stripping, and thin-walled shells may be distorted because of the pressure necessary to strip them. A typical stock layout for a triple tool is shown in Fig. 79.

Such details as draw radii, clearance, venting and other elements of design, are discussed under draw tools, whether single or multiple. The fact that these tools produce quite small products, often from very thin metals, makes it essential to use considerable care and accuracy in their design and construction in order to achieve correctness of detail.

If the tools are carefully made from high-grade die steels, millions of satisfactory parts can be provided on a multiple tool at the rate of 5000 or more per hour. However, dies which are called upon to produce 2, 3, 6 or more identical pieces per stroke, at the rate of 80 to 150 strokes per minute, must be well made. There must be no "penny-wise" economies in either die material or workmanship.

Small shells, such as liquor or cosmetic caps or seals on which a design in lettering or color is required, are usually made on multiple tools because of the large quantities involved. The designs are lithographed on the sheet prior to the press operation. The paint or lacquer must not peel off or crack during the process of drawing; therefore, ultra-smooth drawing surfaces and uniform drawing clearances are "musts," as is careful handling of the stock before drawing and of the product after drawing.

The register of the stock-feeds for this kind of work must be extremely accurate, otherwise the designs or lettering may be out of place on the drawn shell. The lubricant used must not soften or otherwise spoil the coated finish, and must be capable of removal by evaporation rather than by cleaning. Lithographed shells are not made from coil stock because of the limitations of the lithographing and baking processes; therefore press feeds suitable for short strips are necessary.

Presses used for this class of work are special machines, single-action in principle but fitted with many intricate mechanisms to suit the use of short strips. The strips are automatically picked up from a stock of material and accurately fed across the die, the shells are blown through the back of the press, and the scrap automatically kicked off into a container at the side of the machine. The feed fingers which move the stock must be adjustable so that the stock movement can be arranged to suit different sizes of seals.

Progressive Tools

The progressive type of tool, of which a 5-station tool is shown in Fig. 80, is designed to perform different operations at several stations in such a manner that the work is drawn or formed progressively as the stock is moved from station to station. At the last station, a completed product is ejected.

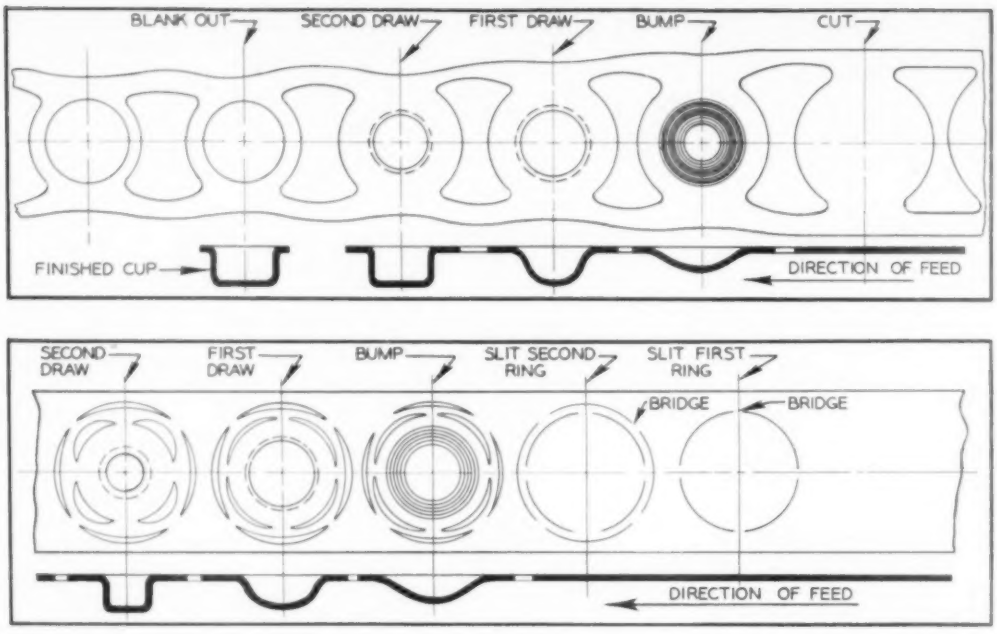


Fig. 81, showing stock layouts for progressive blank-and-draw tools. The upper illustration shows an operation strip for making a small cup, and the lower illustration shows method of slitting the stock to allow for free movement of metal while it is still attached to the strip. In progressive cutting dies, there is no movement of metal except that of cutting. The stock is passed from station to station where each cut is made, and the shape of the metal is not changed as in the case of a forming or drawing operation. When the operation involves metal flow, and changes in shape take place at the various stations, the metal must be made to flow independently, at each station, without pulling or otherwise affecting the work done at the adjacent stations. If the metal is not free to move, the whole strip will be distorted and, in addition to altering the register between stations, the metal will be severely stressed at certain points. This will result in defects in the finished product. To free the metal at points of movement, the stock is sometimes cut away at some point ahead of the drawing stations. This makes it possible to do considerable work at each station without distorting the work done at adjacent stations. The upper operation strip could be used in connection with the tool shown in Fig. 80.

If it is a 6-station tool, the material will be moved from Sta. 1 to 2 to 3, and so on, and it will take six steps to produce the first product. From then on, the tool will produce a finished part at each stroke of the press as long as the strip or coil lasts.

In progressive cutting dies, there is no movement of metal except that of cutting. When, however, operation involves metal flow—as in drawing—changes in shape take place at the various stations. Then the metal must be made to flow independently at each station since, if it is not free to move, the whole strip will be distorted. In addition to altering register between stations, the metal will then be severely stressed at certain points. See Fig. 81, A.

The cut at the first station removes the material from part of the circumference of the blank, but does not separate the blank from the strip. This provides a means of carrying the small work areas across the tool from station to station, for the progressive forming or drawing. The finished product may then be blanked free at the last station and the scrap strip coiled at the take-off end.

The gaps of the slot will become wider, and the width of the strip narrower as the material is moved from station to station. This is because the metal which comprises the blank is free to move toward the center just as if the blank were completely separated from the stock. This freedom of movement makes it possible to maintain the distance between stations on the strip more or less constant.

The method shown at B, Fig. 81, is quite effective on deep progressive draws. At the first station, the stock is sheared with four circular cuts leaving a small bridge between each. At the second station, four additional cuts are made a short distance outside of the first ring of cuts, their bridges located at 45° to the bridges between the first four cuts. When flow occurs, the disc of metal inside the inner ring of cuts is able to move towards the center because it is almost separated from the stock. The slits will open as the metal is drawn in, thus allowing metal movement to take place without pulling metal from adjacent stations.

Re-Draw Tools

Another type of progressive tool, which is used for drawn shells requiring supplementary operations, is the circular or dial type. In this type of tool, two or more punches, each for a different operation, are assembled in a punch holder. The die is in the form of a plate with a series of dies arranged around it. The press machine moves this dial of dies a predetermined distance, and brings two or more shells into position under the punches. The first punch does its work on the shell, which then receives further work when it is moved under the next punch, and so on.

Re-draw tools for single action presses, of which examples are shown in Fig. 82, may be divided into two kinds: those on which the operation may be performed without the use of a blankholder; and those in which a blankholder is necessary in order to prevent wrinkle formation. The first type—shown at A—is limited to re-drawing operations on which the reduction percentage is quite small, or in cases where the thickness to diameter ratio is high enough to allow flow to take place without wrinkling when no blankholder is used.

Tools in the second group are used when making substantial reductions on thin-walled shells. A typical tool of this type, shown at B, is quite similar in general design to the tool shown in Fig. 87, except that the pressure plate is in the form of a sleeve made to suit the shell from the previous operation. A die cushion is necessary for this type of tool, and die cushions will be discussed in the next installment.

Installment No. 9 will follow in February issue.

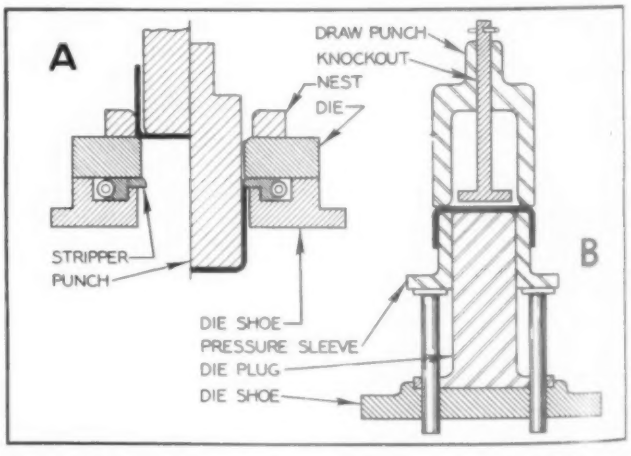


Fig. 82, showing typical re-draw tools for single-action presses. These may be divided into two classes: those on which the operations may be performed without use of a blankholder, and those in which a blankholder is necessary in order to prevent wrinkle formation. Tools in the first group consist of a punch and die as shown at A. The shell is located centrally in a nest over the die opening, and the punch draws the shell into the die in the same manner as in a double-action press drawing operation. Tools in the second group—shown at B—are used when making substantial reductions on thin-walled shells. This tool is similar in design to that shown in Fig. 78 except that the pressure plate is in the form of a sleeve made to suit the shell drawn in the previous operation. A die cushion is necessary with this type of tool.

Tools for Milling Operations

34-91000

By A. E. Rylander

Installment No. 6 of a Series

THE TYPE and composition of cutters required for milling operations depend, primarily, on the nature and materials composition of the work and on the type and construction of the milling machine itself. For example, one would ordinarily assign production milling to the production miller, of which there are many types, and job-lot or tool work to a more versatile machine—such, for instance, as the ultra-modern universal miller shown in Fig. 1. A machine of this type is designed for quick interchange of cutters, and is applicable to an almost infinite variety of milling operations and gear cutting as well as the average run of jig boring.

Fig. 2 shows a typical part which may be machined complete in only three settings—or five if the ends are to be finished—and with only three cutters: a face mill, an end mill, and a T-slot cutter. This part could be milled with equal facility on a ram-type universal miller, such as the Van Norman, or on practically any of the swivelling-head universal millers. The illustration shows work setup and cutter arrangements only.

Production millers range in size from small bench-type millers to huge machines that, in turn, may take cutters which in themselves may be several feet in diameter. These larger machines may be single-spindle horizontal or vertical type, or a combination of vertical and horizontal or even angular spindle arrangement. Once set up, machines of this type may be expected to "stay put" for the duration of an extended production run, subject only to occasional cutter sharpening and exchange and, also, to occasional checking and adjustment to maintain control of dimensions.

A typical production job, set up for multiple cuts, is shown in Fig. 3. Three face mills, running in two horizontal opposed and one vertical spindle, mill the three sides in one pass. By adding two extra vertical spindles, ahead or behind the center spindle, the dovetails could be milled as well in the one pass. Naturally, a setup of this kind would only be warranted for an extended run on similar parts.

In many instances, irregular-shaped parts may be milled by "ganging" a number of standard or special cutters on one arbor, as suggested in Fig. 4. In such cases, and especially if the parts are to be duplicated at a later date, the cutters are retained on the harbor and stored for later use.

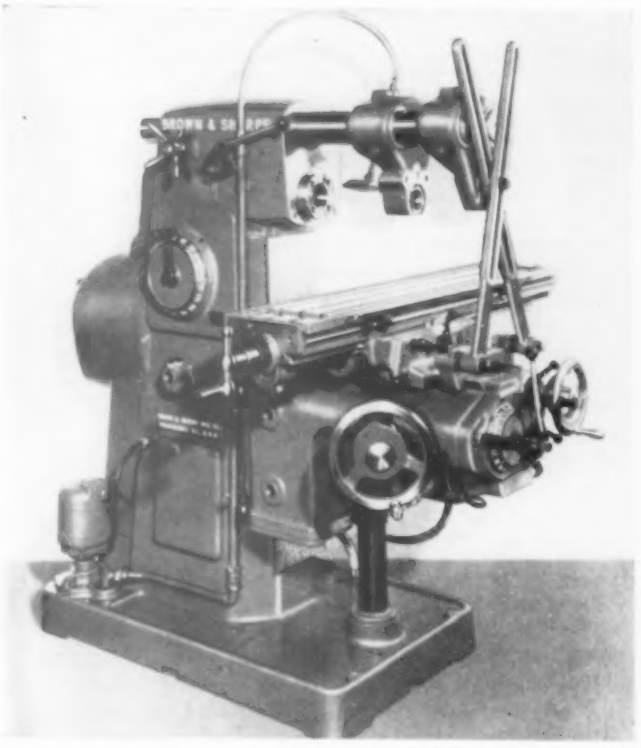


Fig. 1, a late model Universal Milling Machine—the No. 2 by Brown & Sharpe Mfg. Co., Providence, R. I.—which may be considered typical of ultra-modern millers. Engineered for manufacturing as well as tool work, and provided with 2-way swivelling vertical attachment and universal dividing head, and other accessories, a machine of this type is capable of an infinite variety of work, gear cutting included. For example, the part shown in Fig. 2 can be machined with only three settings and three changes of cutters.

Except for the simpler shapes, however, and for fairly long-run production, such ganging is not economical. It ties up too many cutters, for one thing, and requires precise grinding if the form is to be accurately maintained.

The preferred tool for odd-shape milling is the formed cutter, which only needs to be ground on its face and which retains its form for the life of the tool. See Fig. 5 for a typical example. However, form cutters may be used in

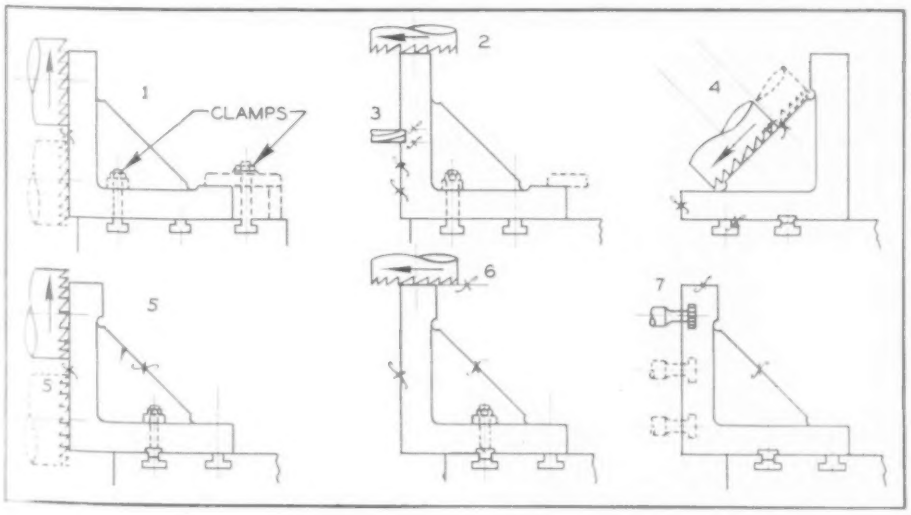
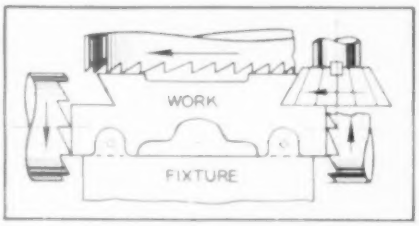


Fig. 2, at left, shows a typical workpiece which can be machined on a universal miller. A ram-type universal miller, such as the Van Norman, would also handle this work with a minimum of resetting and cutter change. Fig. 3, below, shows cutter arrangement for a multi-spindle production miller to machine three sides of a part in one pass. By adding two extra vertical spindles—sometimes done on special machines—as indicated at right the dovetails could be milled coincidentally with the other surfaces.



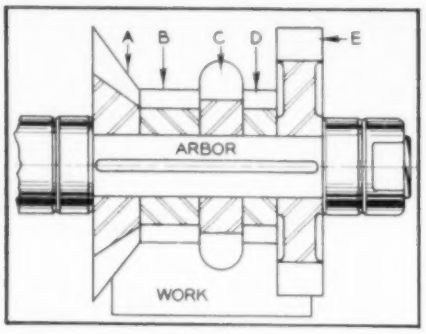


Fig. 4, showing how standard cutters may be "ganged" to produce irregular-shaped parts. Cutters A, B, C, D and E are angular or bevelled, straight, convex, straight and side milling, in the order named. However, ganging of this nature is not economical due to the precision grinding required to maintain the form.

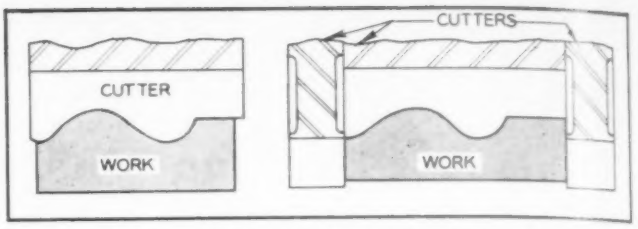


Fig. 5, at left, shows a typical formed cutter for milling an irregular shape. Only grinding the face of the teeth is necessary, and the form is maintained throughout the life of the cutter. However, formed cutters may be "ganged" with side milling or other cutters, as shown in Fig. 6 at right. For a part as shown, lateral spacing of the side milling cutters is effected by shims and only ordinary care is required for their resharpening.

combination with other, standard cutters, as suggested by Fig. 6. It should be stated, here, that the illustrations do not pertain to specific jobs; they merely suggest a few of the infinite variety of shapes which may be milled with form cutters or with combinations of standard cutters which may be ganged together on one arbor.

While the trend is toward the ultra-modern milling machines engineered and built for hyper milling and climb or "in" milling, the great proportion of millers still in current use are older type machines originally designed for conventional or "out" milling. These machines are largely unsuited to the latter-day demands for high production although, in many instances, they are being rebuilt for heavier duty. Since, however, the type of machine employed largely determines the type of cutter or method of cutting employed, we will briefly compare the two methods—that is, conventional or "out" and climb or "in" milling.

Conventional vs. Climb Milling

Until quite recently, milling operations were mainly confined to "out" or conventional milling, the latter term differentiating it from the revolutionary climb or "in" milling. While it is about the only method suited to the lighter old-type millers, it actually aggravates their comparative weakness. Cutting thrust is not only against the feed screws or racks, tending to spring the former, but also tends both to lift the work in the vise or fixture, and the table from its bedways.

This combination of conditions induces chatter, to which may be added the further disadvantage that the cut starts light and ends heavy. That is, each tooth of the cutter takes a chip which is infinitely thin at bottom dead center, but which progressively thickens as the tooth leaves the work, depending on the feed-rate used.

The exact reverse occurs in climb or "in" milling. Here, the tendency of the cutter is to press the work downward against the vise or fixture, and the table against the machine bedways. In other words, it imparts "solidity." Furthermore, the cut starts heavy and ends light, thereby actually decreasing the load on the tooth during its sweep through the cut. See Fig. 7, A and B, for comparison.

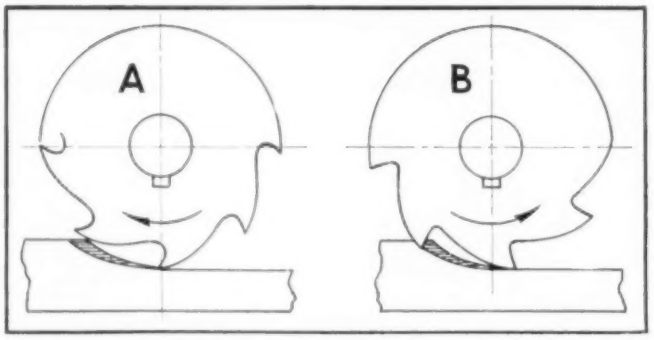
While rigid clamping or work is usually in order, it is possible to perform certain operations, with climb milling, without resort to clamping. During the late ASTE Tool Show in Cleveland, for example, one exhibitor—the Rockford Magnetic Products Company, Rockford, Ill.—demonstrated keyway cutting in shafts. The parts were practically thrown, loosely, into a magnetic V-block, and the cut started at high speed and feed. The magnetized V-block held the shaft in place and kept it from turning. End thrust of the cut was taken by a stop, all as schematically shown in Fig. 8.

Yet another advantage of "in" milling is that, since the cutter tends to pull the work toward itself, more or less as a pinion would pull a rack, it actually lessens the power required for feed. Since, however, the feed mechanism is used to retard the feed-rate, it cannot be claimed that total required power for both cut and feed is reduced. Rather, it is balanced, the advantages being in faster milling with less chatter and vibration.

For in climb milling, the machine must have the same general rigidity that is required for carbide cutters, with the last possible tremor of vibration cancelled out. Also, feed-screw nuts must be compensating to take up wear and, as a natural result, backlash. While it is not implied that strain on the feed-screw is lessened, the fact remains that it is under tension during feed; therefore, there is less tendency toward springing. In many instances, older machines may be adapted to climb milling, although this entails a more or less general rebuilding. For one thing, there must be a positive hold-back, usually achieved only by a screw with—as stated above—a compensating nut that may be adjusted for wear. In the final analysis, however, it is doubtful if such rebuilding for climb milling alone warrants the expense.

It should not be inferred, from the foregoing, that climb milling provides all the answers to modern production demands. It is simply one of the answers, and its pros and cons have been brought out, here, as a basis for further and more detailed discussion on milling cutters to be taken up in following installments of this series.

Installment No. 7 will follow in February issue.



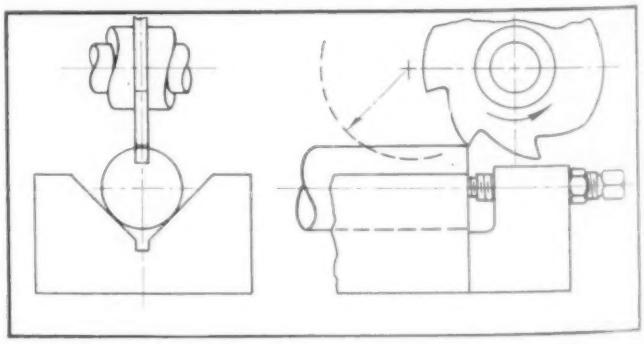


Fig. 7, at left, shows comparison of conventional or "out" milling and climb or "in" milling. "In" milling, at A, illustrates how the chip becomes progressively thicker, in direct ratio to feed-rate, as the cutter bites into the work. The tendency of the cutter is to lift the work from its holding fixture and also to lift the table from its bedways, thus inducing chatter. Climb or "in" milling is shown at B. Here, the initial bite of the cutter is heavy, as it enters the work, but becomes progressively thinner on leaving the cut at dead bottom center. Furthermore, the tendency is to depress both the work against the fixture and, naturally against the table, and also to depress the table against its bedways. Thus, there is a solidity not usually attainable with conventional or "out" milling. Fig. 8, at right, shows how keyways can be cut in shafts, by climb milling, by simply placing the shaft in a magnetic V-block.

GADGETS

Warning for Air Pressure Failure

Many high speed progressive metal dies rely on a timed air blast to eject the finished pieces. Should the air supply fail, and the completed part become lodged in the die, serious and costly die breakage might result along with lost production.

A simple method of providing warning, should air pressure start to drop, is to arrange a pressure switch which closes the contacts to an electrical alarm device such as a bell, siren or horn. This arrangement gives suitable warning; however, should the pressure stay down for a prolonged period, either at the end of the day or in case of a major compressor breakdown, the alarm device would be in continuous operation. A manually operated shut off switch introduces the possibility of not resetting the device when the pressure comes on again, and for this reason the arrangement shown in the illustration has been used successfully.

A thermal time delay relay is wired between the pressure switch and the alarm so that the latter is shut off automatically after about a minute's operation and the system is reset once the pressure comes up again. The line is run through the normally closed contacts of the pressure switch, the contacts being open as long as the pressure is above the danger point, and the normally closed load contacts "A" of the relay. When the pressure drops to the danger point the pressure switch contacts close and the alarm is set in operation.

At the same time the normally closed contacts "B" energize the heater built into the relay which, after about a minute, becomes hot enough to cause the bimetallic contacts "C" to close and to energize the relay coil. This opens the normally closed contacts "B" to the heater and, at the same time, closes the normally open contact "B," thus keeping the coil energized as long as the pressure switch contacts are closed. The coil also opens and keeps open the normally closed load contacts "A," thereby shutting off the alarm after it has been in operation long enough to warn the press operators and enable them to shut down their machines. Once the pressure comes on again the switch contacts open and the relay coil is deenergized.

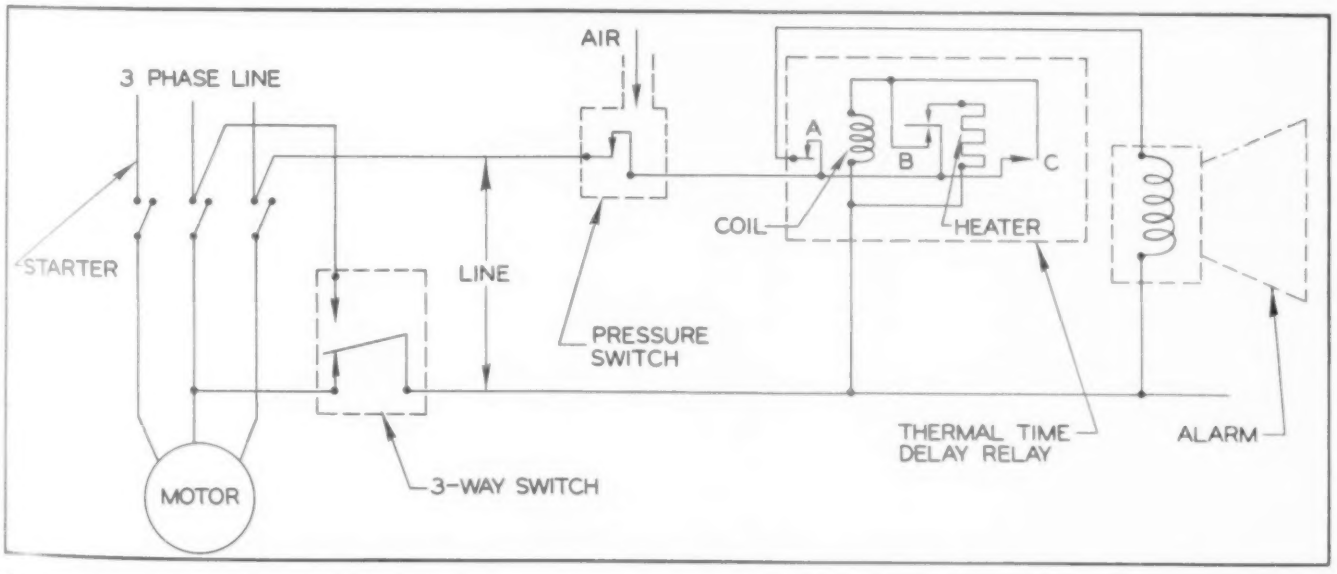
If there are considerable shutdowns, the relay coil will be energized for the total time of the shutdowns and, while a continuous duty relay should be used, it is advisable to connect the wiring with a device that is always in operation and easily noticed if it should fail—such, for example, as a continuously running tumbling barrel. By shutting this off at the end of the shift the alarm is also shut off.

The illustration shows how the unit is wired to a 3 phase motor such as found on a tumbling barrel. The 3-way manual switch allows the operation of the device either only when the motor is running or, by by-passing the motor starter, the device may be left on continuously. Theoretically, the use of a single phase device hooked into a 3-phase line will unbalance the electrical supply system; however, the load of the alarm unit is very small compared with the load imposed by a fair sized motor.

For those readers who are not too familiar with the electrical industry a suitable pressure switch is the type P-11, manufactured by Allen-Bradley, and a good thermal time delay relay is the Struthers-Dunn model PTCH-1. The total cost of switches, relay and alarm bell is in the neighborhood of $40.00, a small price to pay for the protection of expensive dies.

Paul H. Winter
Syracuse, N. Y.

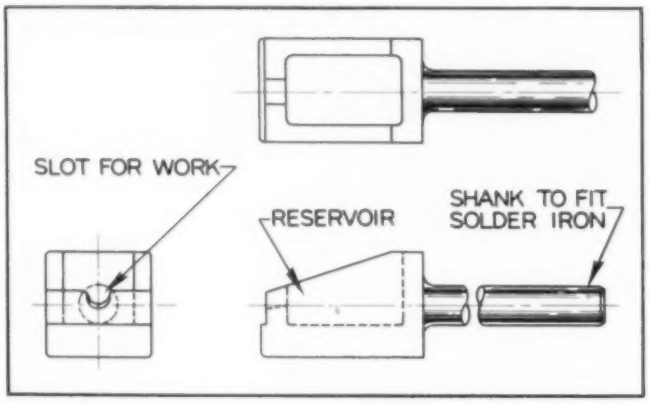
Readers, members especially, are cordially invited to submit ideas which may suggest short cuts in manufacture or which may be directly appended to some specific tooling problem. The Tool Engineer will pay $5.00 and up for accepted contributions to our Gadget pages.



This layout shows how the unit is wired to a 3-phase motor, such as might be used on a tumbling barrel. The 3-way manual switch allows the operation of the device either only when the motor is running or, by by-passing the motor starter, the device may be left on continuously.

Reservoir Solder Tip

In a special-type soldering tip developed to be used with a standard soldering iron, the iron is fastened in a temperature-regulating stand, thus eliminating the handling of the iron. Solder is fed into the reservoir either by a solder feeder or by hand. With proper heat on the iron, the solder will melt and run into the slot or neck of the reservoir.



The reservoir keeps the slot supplied with solder as each piece is soldered and removed.

Parts to be soldered are conveyed by hand to the slot or groove in the solder tip. The reservoir will keep the slot supplied with solder as each piece is soldered and removed. This soldering tip saves solder, makes a good joint and reduces work-handling and, consequently reduces worker fatigue.

A. J. Pangburn
Binghamton Chapter, ASTE

Internal Groove Checking

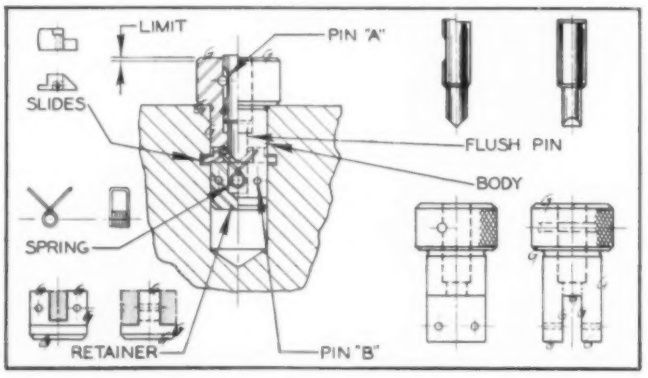
The flush pin gage illustrated has proved itself to be highly satisfactory for accurate and positive checking of internal groove diameters. Its simple design and construction allows the gage to be used efficiently by even the most inexperienced operators including the many blind individuals now employed in our inspection departments.

The body is made of hardened and ground tool steel, with a milled and ground slot allowing a slip fit for the slides and also a reamed hole providing a slip fit for the flush pin. The retainer, which has all wear surfaces hardened and ground, is first turned as a straight plug, allowing grinding stock where needed, and then carburizing.

The flush pin is sharpened to a 45 degree chisel point and is kept from rotating by pin "A". A pair of tool steel slides are made to telescope each other by machining the angled end to half the total width. Being made this way the slides have a greater bearing and also control the amount they retract.

If, for example, the grooved checked is 0.187 in. larger in diameter than the hole, an equal amount machined from the slides will allow sufficient travel. The return travel—or retraction of the slides—is actuated by the torsion spring illustrated, which can be made from a length of music wire.

The operation of the gage is rapid and exacting. By merely inserting the piloted end in the hole and depressing the flush pin with one finger the result is found. By leaving clearance at the top and by making the length of the pilot below the slides to suit, this gage can be used to locate from shoulders or bottomed holes.



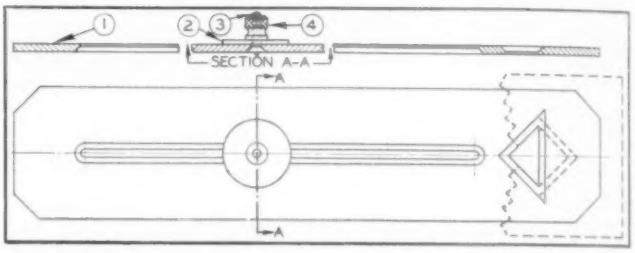
To operate this gage, insert the piloted end in the hole. Then depress the flush pin with one finger to find the result.

Stanley R. Welling
Racine Chapter, ASTE

Drafting Tool for Serrations

A tool for layout of serrations on curved or straight-line serrations, as shown, will prove a time saver in the drafting room. While construction details are obvious from the illustration, a short explanatory note may not be amiss.

The body (1) is made from transparent sheet plastic and has a ⅛ in. wide slot, bevelled as shown. The 45° triangle, shown at the right end of the body, has its 90° angle pointing toward the slot, and in line with it.



This tool may be used with equal facility for both inside and outside curved serrations or for straight line work.

The centering point, detail (2), is made of stainless steel and has four graduations, 90° apart, for locating the point of the screw, (3), with two crossing center lines on the drawing being made. The knurled nut (4) is used to hold the centering point screw in place, once it has been located.

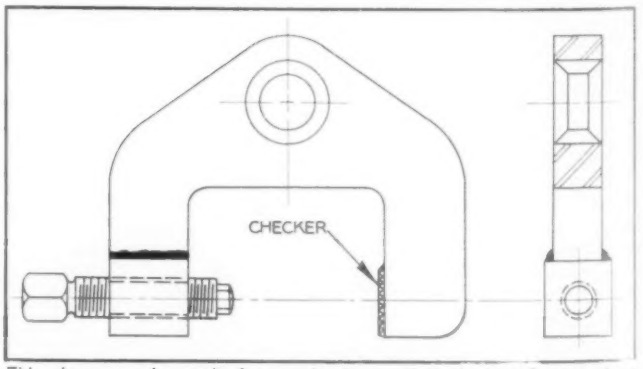
As shown, the tool is used for drawing serrations on curves, either outside or inside. If, however, a square opening be substituted for the triangular, then the tool becomes "universal" and, by removing the centering screw, can be slid along the straightedge for straight-line serrations.

Robert E. Kidd
Pekin, Illinois

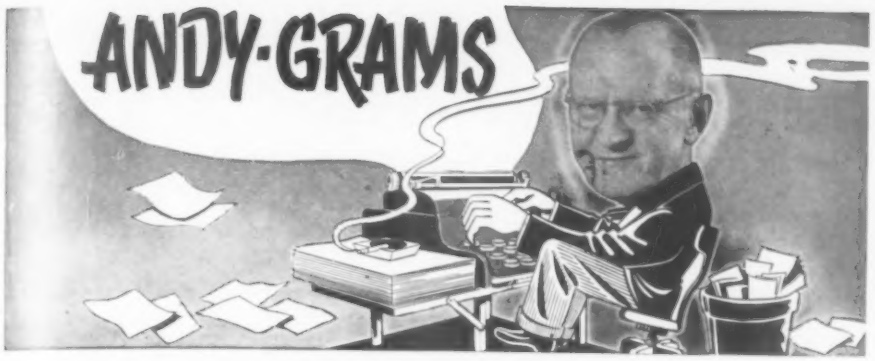
Clamp To Handle Dies

A simple clamp for turning over dies, made to suit the class of dies being handled, is made from 1 in. thick cold rolled steel. It can be thickened up by welding, where the set screw goes through, or one may weld on a tapped nut, as may be desired. The clamp has the advantage of keeping the die under control when it is on its side, as the hook of the chain falls does not have to be slid along the clamp.

George Hull
Detroit, Mich.



This clamp can be made from a forging or from bar stock oxy-cut to shape. The eye is bevelled for convenience in crane work.



Y'know, I plumb forgot all about the column in the rush of other editorial work, and here Jimmy Curran—our production mgr.—jumped all over me a/c the deadline is up to our composite neck just like Jim Scott's alligators. And now what-in--'eck can I think of in a hurry that's worth writing about I don't know. . .? But don't crowd me and I'll get there somehow—d—n this typewriter anyway! Every other word the keys stick or jam or the wrong key gets under the right finger. Anyway, this is off the record so don't pay any attention to my ravings. I get that way whenever I sit down to write.

Before I forget it, I'd like to give a hint to those of our readers who send in requests for info on items published in our Tools of Today department. You'd be plumb surprised at the number of enquiries coming in where the sender has forgotten to include his name and address. And how in heckelfelt are we going to give the info if you don't tell us who you are? Reminds me of the story about the French Canuck who mailed in a complaint to a mail order house anent a gadget he'd bought:

Dere Monsieur
Longtemps now I ordair from you one pump to pump the water in my well an' you send the pump but you no send the handle to pump the pump and how you expect me to pump when I aint got no handle I want you to send the handle right way an' no fooling

Yours truly
Jean Baptiste

PS please excuse it sil vouz plait since I write this letter I find the d—d handel in the box so now you don't have to send it, Jean Baptiste

Now, maybe you think that's a corny joke but I've heard worse. Anyway, I've broken the ice and got started. Now, in serious vein, I want to thank all you boys North, East, West, South who sent me Christmas cards. The same to you and many of 'em! Once on a time I used to design my own Christmas cards, and have had the best of intentions for the four years I've been on this job. But, the deadlines have been playing leapfrog and time has fugited too fast for more than the bare intention. So, I've extended blanket greetings in my Andygrams, hoping that each reader, and my closer friends in particular, would take them as a personal greeting. Next year I'll design some cards . . . I hope.

For me, the holidays were most enjoyable, the more so now that the (grand) family is growing and children's voices ring out as of yore. Only trouble is that, to so many children throughout the world, Christmas is just another date on the calendar. No need for Santa to come down the chimney—he can jump right down through roofless rubble. But then, why figure that giving is done with on Christmas day when suffering goes on apace during the year?

Y'know, we hear a lot of debunking about Christmas; it's all a myth and all that and all mixed up with English yule logs, Scandinavian—or German—evergreens and Druid mistletoe and commercialism. And I admit all that, but so what? The Spirit of Christmas is as real as terra firma itself and not one thing in its message but what would make a better world if the message were taken literally.

The Scandinavians have one custom—and I don't mean lutefisk—carried over from medieval times. That is the Lucia festival, which was brought sharply to mind at a recent symphony concert I attended. Then, coffee and cakes are served, usually catching the "guest of honor" in bed.

I remember, as a lad of six, starting out with my grandmother on a crisp northern morning to serve "kaffe och dopp"—coffee and dunk to you—to an aging couple who lived some distance away. Underfoot, the creaking snow, and around us in the deep woods the frosted pines swayed to the tune of an aeolian harp.

Overhead, the milky way bridged the universe, yet seemingly so close that, like the crackling stars, one could almost reach up and touch it. And then the surprise!—and greetings, and homeward through the enchanted night. Well, the "guests" and grandmother have long since found their places in the galaxies, but to me the memory of that morning is as clear as though it had happened this very morning. Like Christmas itself, it's ever new.

In common with many of our members, I find myself saddened by the passing of Horace Wentzell, "grand old man" of South Bend Chapter and honored and respected by all who had the privilege of knowing him. To Mrs. Wentzell, whose acquaintanceship I also enjoyed, my deep and sincere sympathies in the loss of a fine mate—yet, the cold pride in having been the mate of that man! As for this Society, we are the richer for the work that Horace has done.

Well, winter's here at last, having stalled along but now hinting of red flannels and ear muffs. Funny about that, when I was in California last October I couldn't get back to Michigan fast enough, and now that I'm here I'd like to be back in Pershing Square, L. A., barking to the screwballs who make that garden of heathens a forum for everything zany. By the way, did they have any luck chasing the rats out of the cocoanut tree? All right, now, don't get mad, you Californians! I'm only asking. And didn't I say I'd like to go back?

From one thing to another, we're beginning to get healthy responses to our requests for Gadgets, although not up to expected par as yet. A nice billy doo from Walter Pohle—and how did he ever guess I meant him in the previous Andygrams?—saying he's coming through with some of his famous innovations. But that doesn't mean that the rest of you lay down on the job. Keep 'em coming, and the more the merrier.

Let's see, now, what else have I got in my notes. . . . ? Oh yes, go to the dentist and get some teeth pulled—no no, that doesn't belong here besides which I'm stalling off . . . . fix up the bird feeder . . . tie suet on the tree . . . But I've done all that. Y'know, writing this column under pressure is a h—l of a chore especially when n o t h i n g happens and when I ain't supposed to say anything even if it does. Oh well, there's only a few lines left and then I'll be done. Wish I had a guest artist to take over when the muse lays down on me. Right now—but there it is, the final •

ASTEly Yours

Andy

Cutting Fluid Application Chart

Data in these charts are classified on the basis of machinability ratings for turning, determined by Boston, Slaughter and Hergenroether for the Independent Research Committee on Cutting Fluids. Hardness ranges (numbers on either side of the horizontal bars) are in 3000 Bhn, current data for cold-rolled steel bar stock.

The three bars shown on the charts indicate (a) influence of cutting speed, ranging from low to high, (b) influence of cut depth, ranging from heavy to light, and (c) relative difficulty of machining operations. These will aid in fixing the point on the horizontal bar from which the cutting fluid should be determined. Relatively easy operations (milling, boring, turning) done at high speed with light cuts would indicate readings for cutting-fluid selection toward the right end of the bar. Readings for more difficult operations would conversely be found toward the left.

As an example, a C1120 steel of 80 machinability is to be broached. It is found that the figure of 143 is well centered under oil 7 at the top of the chart, indicating that oil 7 is well suited to the job, although oils 5 or 6 might also be satisfactory. Since broaching is well to the left of the lowest bar, this would tend to confirm use of oil 7.

Following are the types of oils shown in the charts:

1. Ordinary soluble oils or emulsions—normal cutting mixtures, 1 part oil to 10 to 30 parts water. Products of this class may, in their original state, be either oily or pasty, but may be considered emulsifiable petroleums.

2. Supersoluble oils or compounds—normal mixtures, 15:1 to 50:1. Grinding mixtures, 30:1 to 100:1. These generally form emulsifiable products of higher quality than the petroleum compounds.

3. Low-viscosity oils, kerosene, mineral seal, etc., and their mixtures with small amounts of fatty or other cutting bases, viscosities usually below 50 sec at 100 deg F, SUV.

4. Straight petroleums and mixtures with low percentages of fatty or other bases and with viscosities ranging from 75 to 150 sec at 100 deg F, SUV.

5. Mixtures of petroleum with from 10 to 30 per cent of fatty oil or with not more than 1 per cent active sulphur. Viscosity from 80 to 200 at 100 deg F.

6. Pure fatty oils, mixtures of sulphur-bearing and petroleum bases with up to 2 per cent active sulphur.

7. Sulphurized petroleum, sulphurized fatty mixtures with maximum sulphur activity.

8. Pigmented compounds, mixed with oil or soaps to a pasty or semifluid consistency using pigment such as white lead, graphite, talc, or other unctuous pigments.

CHART A

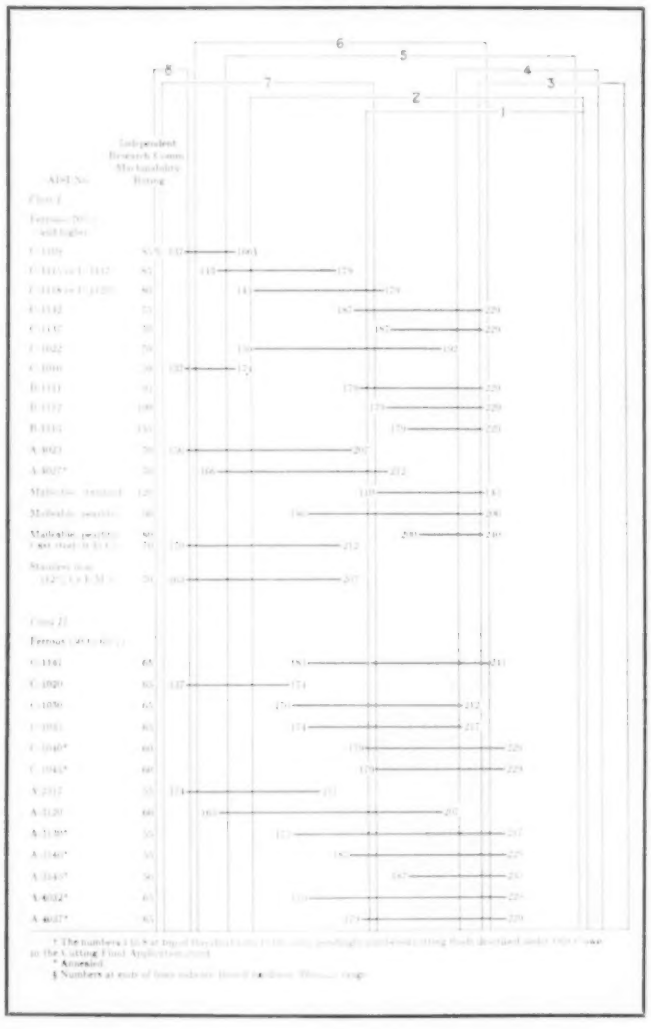
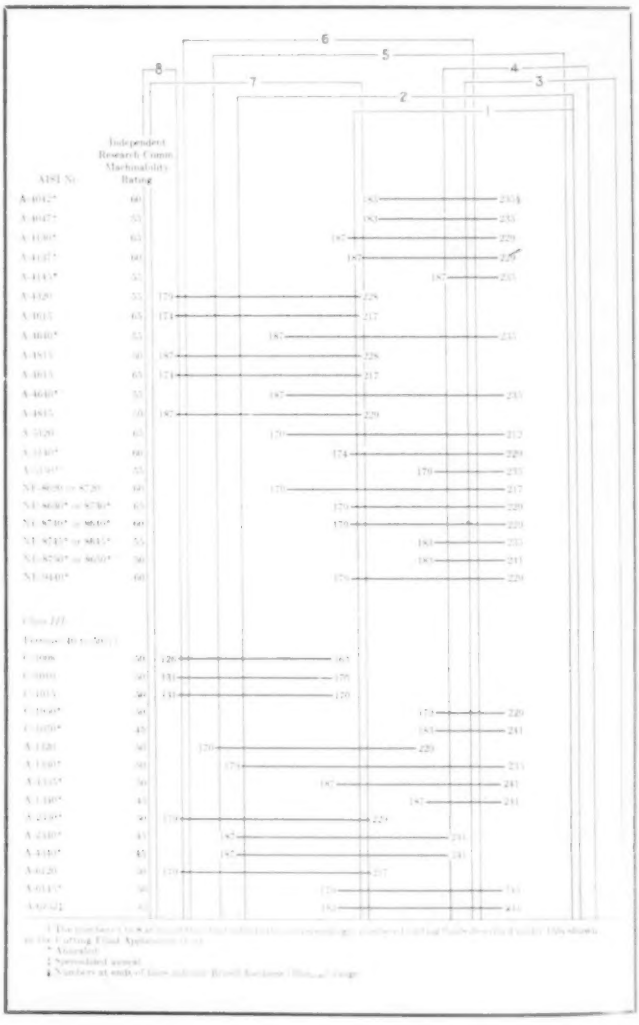


CHART B



Oil Selection vs Machining Applications as Shown in Charts A-D

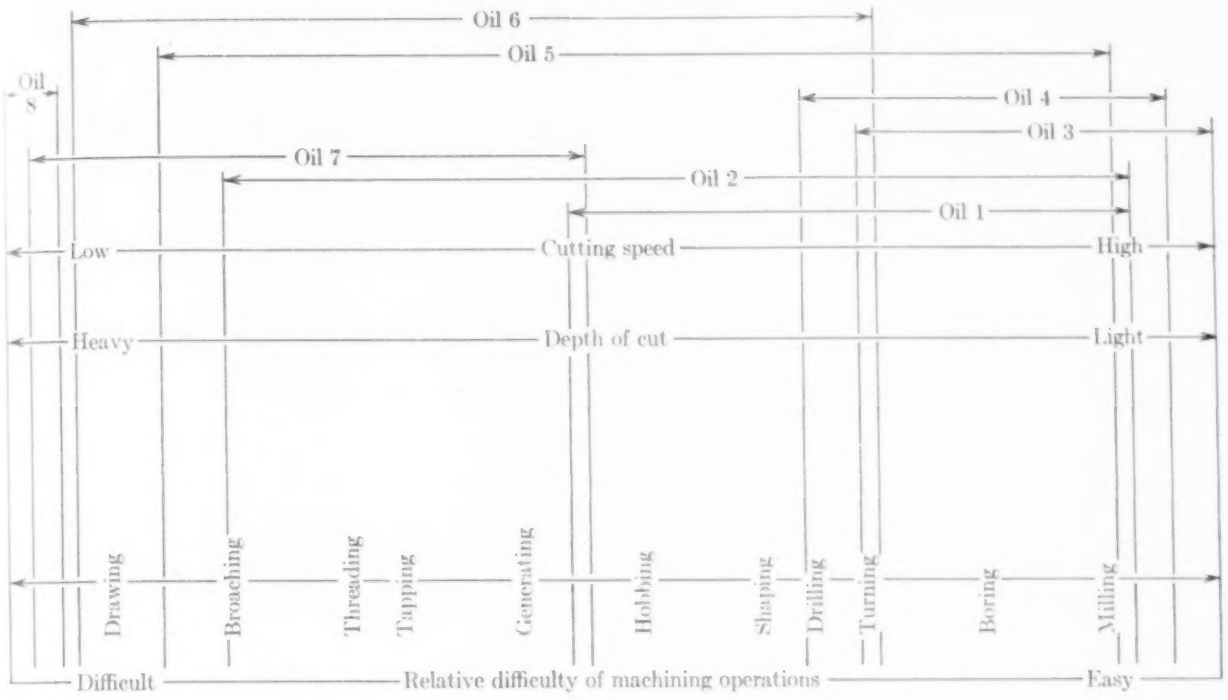


CHART C

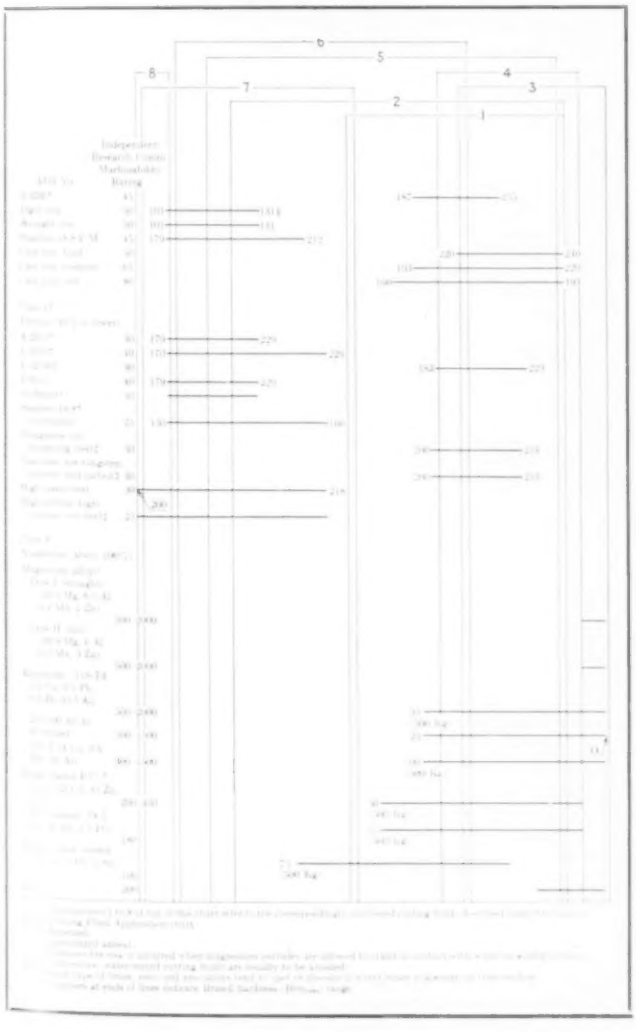
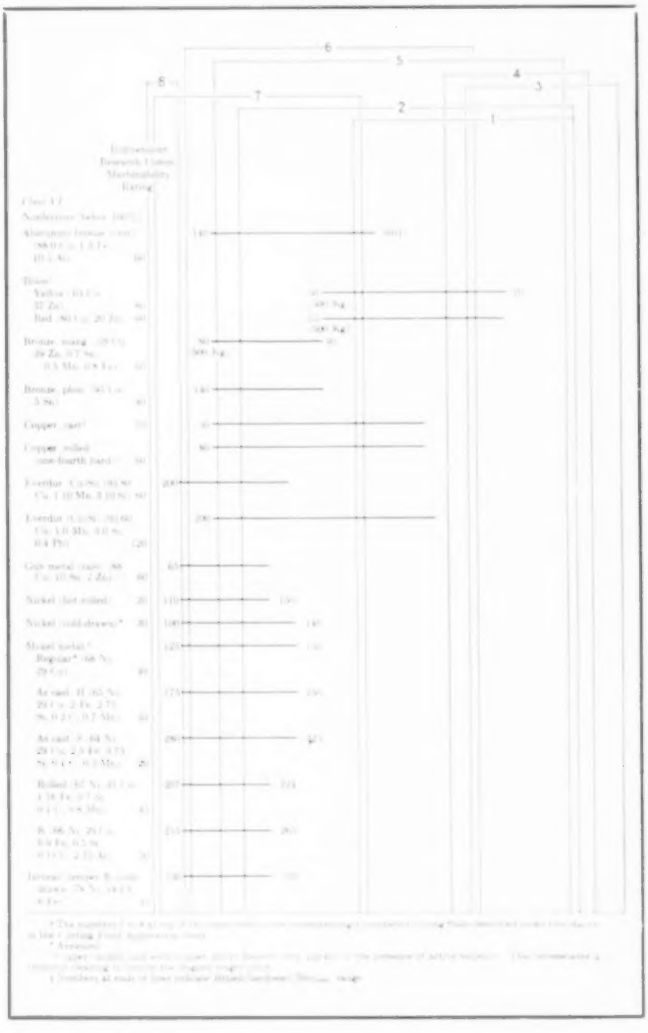


CHART D



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Hotel William Penn in downtown Pittsburgh will be hub of actvities for the ASTE convention, March 10-12

Society Will Observe Birthday at Pittsburgh

17th Annual Meeting Events Set for March 10-11-12

PITTSBURGH, with one of America's greatest concentrations of metal refining and metal working, is entertaining ASTE on its 17th birthday. The Pennsylvania city will be host to the Annual Meeting of the Society, Thursday, Friday and Saturday, March 10-12, at Hotel William Penn.

Staged in the geographical center of 73 per cent of the population of the United States and of 45 ASTE chapters, the meeting gives a majority of the Society membership opportunity to participate in a national convention of tool engineers.

It will be unique in that all speakers are being invited from the Pittsburgh area and program arrangements are being made through the local convention committee.

Concurrent Technical Sessions

Six technical sessions will be presented Thursday and Friday evenings and Saturday morning. At 8:00 p.m. Thursday there will be a choice of two meetings, one on "Forging Die Design," the other, "Industrial Applications of Glass" and "Color Dynamics."

"Machining and Forging of Corrosion-Resistant Steel" will be discussed Friday evening. Saturday morning will be devoted to "Metallic Spraying of Hard Metals" and "Problems in Machining Aluminum."

In order to bring this technical information to all members interested, papers will be preprinted for distribution on application.

Practical demonstrations of varied metal processing operations will be seen in a number of plant tours. Starting Thursday noon there will be visits to National Supply Co. and James H. Matthews & Co., Bronze Div., Pittsburgh; and the Nuttall Works of Westinghouse Electric Corp., East Pittsburgh.

Friday's schedule includes Aluminum Co. of America Fabricating Works at New Kensington, Firth-Sterling Steel & Carbide Corp., Carnegie-Illinois Steel Corp. Irvin Works, Dravosburg; Westinghouse Electric Corp. East Pittsburgh Works, the Air Brake Div. at Wilmerding, and Gulf Oil Co. Research Laboratories at Harmarville.

The House of Delegates will assemble Thursday to elect directors, and the incumbent board will vote for national officers during its session Friday.

A visit to Buhl Planetarium has been arranged for Saturday afternoon and an auxiliary program is planned for ladies attending the convention.

Concluding event will be the annual dinner and national membership meeting Saturday evening in the ballroom of the William Penn, when a Pittsburgh industrialist will address the group. Newly-elected national officers and Pittsburgh chapter officers will be installed.

Meeting jointly at Pittsburgh, December 3, the National Program Committee and Host Chapter Committee set up the program. E. W. Baumgardner of Cleveland, national program chairman, conducted the meeting.

Attendance included F. J. Schmitt of Chicago, first vice-chairman, and Gardner Young, Pittsburgh, of the National Program Committee, and H. M. Windsor of the Central Office, secretary to the committee.

Local convention committee chairmen present were: W. S. Risser, general chairman; W. H. Schott, general vice-chairman; W. W. Walter, technical program; H. G. Eisele, records and reports; F. W. Hammer, signs; J. M. Lloyd, publicity; William Owen, banquet; D. L. Bardes, registration and reservations; J. H. Thomas, meetings and arrangements; J. P. Wiley, plant tours; W. B. Peirce, reception; and Committeemen R. W. Piper, W. J. Bickmore, H. L. Harper and E. T. Hutton.

Others heading committees are Paul H. Magnus, transportation; and G. C. Wood, emergency.

Full details of the convention will be announced in the February issue.

By the direction of its travel back and forth across a pit in Buhl Planetarium, Pittsburgh, the Foucault Pendulum demonstrates the earth's daily rotation on its axis. A visit to the planetarium is on ASTE convention program

AN OPEN LETTER . . .

from the President

Dear Fellow Members of ASTE:

Personally, and in my capacity as president of the Society, I want to extend to you the most cordial wishes for a happy, successful and prosperous 1949.

We are beginning this new year with a new home . . . and I do not know of a better way to start what promises to be an eventful and progressive year for ASTE. Our building, spreading a block on Puritan Avenue in Detroit, represents a dream which has at long last come true. Architecturally and structurally, it is a most attractive edifice, modern yet dignified . . . and one of which we can all be justly proud.

Meeting Facilities Available

But even more important than its aesthetic lines and structural soundness, it provides ample space for the efficient handling of the Society's numerous and expanded activities. Staff members no longer work in crowded rooms. There is plenty of room for files, records and reference material. In addition, a conference room is available for meetings of committees, the Board of Directors, and other gatherings. Always before, such meetings have been held away from the Society's headquarters, away from people and material that were often needed. Now, our committees and the Board can work with these things close at hand.

Erection of this building is indeed an important milestone in the history of the Society. As an organization, we will be 17 years old in March. In spite of that, we are still the youngest of the recognized professional engineering societies. Such steps as the acquisition of our own headquarters building add greatly to our stature.

Pride in our new home should give us an added incentive to put forth our greatest efforts toward fulfillment of the Society's aims and objectives, and to take full advantage and make full use of all our membership in ASTE offers.

The headquarters building provides an imposing facade behind which to carry on our work. It also provides a challenge in higher standards . . . a challenge to us to live up to the facade we have erected to represent us.

IRWIN F. HOLLAND, *President*
AMERICAN SOCIETY OF TOOL ENGINEERS

Explains Tooling of B-36

San Diego, Calif.—Tooling problems encountered in building the world's largest land-based bomber, the B-36, were revealed to San Diego chapter by R. E. Bechtol, chief tool engineer for San Diego Div. of Consolidated Vultee Aircraft Corp., in an address, November 9, at the Imig Manor Hotel.

Two metals, magnesium and 75 ST aluminum, were comparatively new for aircraft use, said Mr. Bechtol, as he went on to give technical data about solving difficulties as they occurred.

A color-sound film of the Aleutian Islands campaign showed steps necessary to drive the Japanese from their foothold there.

Ford Promoted

Detroit, Mich.—Robert W. Ford, ASTE national director, has been appointed assistant sales manager of the machine tool-cutting tool division, Ex-Cell-O Corp., the company has announced.

Since 1938 Mr. Ford has been field engineer for Ex-Cell-O in the Pittsburgh area. Earlier he was employed in the machinery engineering department, and by Ohio Steel and Foundry Co. and Thompson Grinder Co.

A past chairman of Pittsburgh chapter, ASTE, Mr. Ford has also headed the National Program Committee.

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Gaging Experts Emphasize Handling and Standards

Philadelphia, Pa.—A symposium on "Gaging Methods for Greater Accuracy" was the technical feature presented by Philadelphia chapter at a meeting November 18 in the Engineers Club.

The panel speakers were C. W. Kennedy of Federal Products Corp.; Louis Mahlmeister, The Sheffield Corp., and A. H. Emery, Standard Gage Co.

Emphasis was on gage application in specific operations and the importance of proper handling of gaging instruments by production personnel, inspection departments, and the necessity of maintaining correct gaging standards.

A lengthy open discussion was enjoyed by the audience of more than 250 members and guests.

Greater accuracy in gaging was stressed by (from left) C. W. Kennedy of Federal Products Corp., Louis Mahlmeister, Sheffield Corp., and A. H. Emery of Standard Gage Co. in symposium presented at Philadelphia chapter

The dinner meeting opened with an invocation by Howard W. Gross, a former chairman. Leonard Subber was welcomed back after a long illness.

Guests included Noel DeCordova, first chairman of Mid-Hudson chapter, who was introduced to the membership.

Appointment of George A. Daum as assistant to Byron Gates, secretary, was announced by Samuel R. Boyer, chairman.

The Standards Committee, under the direction of Harry Smithgall and Eric Lund, has initiated a program in cooperation with the National Standards Committee, towards establishing tool engineering standards.

Tool Planning Should Include Methods Analysis

Flint, Mich.—Methods analysis previous to tooling is extremely important to avoid costly tooling changes or "second guesses," Walter Eitel, head of methods dept. and tool engineering at AC Spark Plug Div., General Motors Corp., and author on methods analysis, emphasized in an open forum at Flint chapter.

Mr. Eitel conducted a discussion period at the November 18 meeting, following a timely lecture on "Methods Analysis Applied to Tool Planning" by Donald Johnson, also of the AC Spark Plug Div.

Ralph Cook, chapter chairman, appointed A. W. Blackmon public relations chairman to succeed Michael Skunda. The dinner meeting at Frankenmuth was attended by 146 members and guests.

Blames Brazing Stresses For Carbide Failures

Springfield, Vt.—Twin States members heard an unprejudiced discussion of carbide tools when W. P. Coomey, general superintendent, Rice Barton Corp., Worcester, Mass., addressed their November 10 dinner meeting at Trade Winds Cafe.

Experienced in machining heavy castings for paper mill and other machinery, Mr. Coomey lectured on "High Speed Planing with Carbide Tools."

About 50 per cent of standard carbide tools on the market are defective, he believes. Most of these failures are due to stresses in the brazing operation through difference of the coefficient of expansion between the steel shank and the carbide tip.

At the Rice Barton plant this condition has been eliminated by brazing the tip to the shank with a nickel shim between. With carbide tools made in this manner and ground to certain rake, lead and clearance angles, they can plane semi-steel castings at speeds up to 300 fpm. with feeds of from $\frac{3}{64}$ to $\frac{1}{8}$ in. and depths of cut up to one inch.

Howard Rich, Jr., of Lynd-Farquhar Co., Boston, Mass., assisted Mr. Coomey by showing motion pictures demonstrating high speed planing in the speaker's plant. The film was made by Mr. Rich.

Following Mr. Coomey's question period was the showing of a General Electric sound picture, "Materials Handling." This film demonstrates advantages and recent developments of electric hoists, conveyors and trucks as applied to materials handling. Pelletized unit loading is emphasized as an economical system of handling many types of merchandise.

Besides guests from local plants, there were visitors from Proctor, Vt.; Boston and Worcester, Mass.; Hartford, Conn.; Detroit, Mich.; and Denmark.

Chairman William Hadfield presided, and Program Chairman Lee M. Davis introduced the speaker.

Tells How Grinding May Injure Surfaces

New Haven, Conn.—Surface damage resulting from improper grinding and the effect of faulty heat treatment in connection with grinding were explained to New Haven chapter by Dr. Leo P. Tarasov of the Norton Co. research laboratories.

Dr. Tarasov addressed 55 members on the subject, "Injury in Ground Surfaces," at a dinner meeting November 11 in Hotel Clarke, Derby.

With slides the speaker illustrated effects of right and wrong grinding, how different steels react to various heat treatments, and the effect of grinding on decarburized surfaces and very sensitive steels.

Important factors in grinding he listed as wheel selection, correct wheel dressing and the use of diamond truing devices.

At the conclusion of his talk, Dr. Tarasov capably answered questions from the floor. Johannes Erler was technical chairman.

Speaking at a recent Baltimore chapter meeting are, from left: Samuel S. Stine, manager of aviation gas turbine div., and Robert L. Wells, manager of design and projects section, Westinghouse Electric Corp., who explained design and tooling of jet engines; and G. W. McLaren, Glenn L. Martin Co. recreation director, who discussed football

Jet Experts Relate Engine Design Problems

Baltimore, Md.—Jet engines, past, present and future, were the subject of a technical session at a Baltimore chapter meeting, November 3.

Approximately 150 members and guests heard Samuel S. Stine, manager of the aviation gas turbine division, and Robert L. Wells, manager of the design and projects section of this division of Westinghouse Electric Corp., relate designing and tooling problems in connection with jet engines.

Using motion and still pictures for illustration, Mr. Wells presented design features of the Westinghouse jet, its development from inception, improvements, problems encountered by designers in achieving the desired performance, and conjecture on future types of jets.

Mr. Stine explained how the intricacies of turbine design as applied to steam engines can be used for the turbine and compression of jet engines.

He showed slides of engine designs as they come to him for development and manufacture. Jigs and fixtures used in manufacturing the engines were pictured as was the development of a field service jig and fixture.

G. W. McLaren, director of recreation for the Glenn L. Martin Co., was the coffee speaker, discussing football.

Welding Shown in Slides

Akron, Ohio—"Resistance Welding—Its Application and Tooling," was the subject of the November 8 meeting of Akron chapter at Semler's Hotel. Foster R. Woodward, chief application engineer from Progressive Welder Co., Detroit, presented a talk supplemented with slides illustrating welding equipment and unique applications.

W. B. McClellan, ASTE national secretary, also of Detroit, spoke of benefits derived from the series of regional meetings held last spring.

The entire group signed a convalescent greeting card to be sent to George "Pappy" Irwin, chapter chairman, confined to a hospital following a serious operation.

Directs Evening College

Philadelphia, Pa.—Kenneth W. Riddle, associate professor of mechanical engineering, Drexel Institute of Technology, has been appointed director of the Drexel Evening Diploma School, Dr. James Creese, Drexel president, has announced.

Connected with Drexel for the past 20 years, Mr. Riddle is associate chairman of the Education Committee of Philadelphia chapter, ASTE, a member of ASME and of the American Society for Engineering Education. He is also a Drexel alumnus.

Members Urged to Vote in Directoral Election Preliminaries

22 Candidates Being Considered at Chapter Meetings This Month

IT'S TIME to vote again. You and every other ASTE member should go to the polls in January and February to tool the machinery for electing the 1949-50 Board of Directors of the American Society of Tool Engineers.

This small group of 11 men controls the destinies of your Society, appropriates its funds, directs its activities. It's vital to have the right men.

At your January chapter meeting, you will have an opportunity to indicate your choice of nominees for directors, for the guidance of your chapter delegate. You'll also be asked to vote for a chapter nominating committee. This committee will draw up a slate of candidates for chapter representative to the House of Delegates and for chapter officers.

In February the membership of each chapter will elect its delegate and its officers. During the seventeenth Annual Meeting at Pittsburgh in March, the House of Delegates will assemble and elect a Board of Directors to take office at the Semi-Annual Meeting next fall. The present board will choose the national officers. Of these the president must be a member of the incoming board.

So your vote is important to the final results. If you do not participate in the democracy of your Society, you cannot criticize its administration.

Additional directoral candidates may be presented before February 1st by a special nominating committee. But no nominations may be made from the floor of the House of Delegates.

The Annual Nominating Committee has chosen 22 candidates for directors. The committee, appointed by President I. F. Holland, consists of W. B. Peirce, chairman, of Pittsburgh; E. V. Johnson, Dayton; E. Wayne Kay, Detroit; Anton Peck, Los Angeles; and Richard Smith, Hartford.

Ten directors will be elected by the House of Delegates. Mr. Holland, the present Board chairman, will become the eleventh as provided in the Constitution (Div. 1, Page 3, Lines 50-53):

> *The retiring president shall automatically become a director from the date of his retirement until the next Annual Meeting.*

All other national officers must be nominated as stated in the Constitution (Div. 1, Page 3, Lines 53-58):

> *The vice-president and/or vice presidents, secretary, and treasurer shall automatically become nominees for directors, and their names must be placed on the ballot for the next succeeding election of directors.*

Two incumbent directors, Mr. Peirce, and G. S. Wilcox, Jr., of Detroit, have withdrawn as candidates for re-election.

The Annual Nominating Committee has issued its report in a brochure including photographs, qualifications and Society background of candidates. Distribution of the brochure will be made to members attending January chapter meetings. The report follows:

As provided in the Constitution and By-Laws (Div. 1, Page 3, Lines 15-19), the Board of Directors of the American Society of Tool Engineers consists of 11 members, 10 of whom will be elected by the House of Delegates at the Annual Meeting of the Society to be held in Pittsburgh, Pa., March 11, 1949.

Directors elected on that date will take office at the Semi-Annual Meeting in October, 1949.

I. F. Holland
President
Chm. of Board

L. B. Bellamy
Chm., Natl. Standards Com.

K. L. Bues
Director

J. C. Cogburn, Jr.
Chm., Education Com.
Atlanta Chapter

H. E. Collins
Director

J. J. Demuth
Director

T. J. Donovan, Jr.
Director

R. B. Douglas
1st V.-Pres.
Director

V. H. Ericson
3rd V.-Pres.

The retiring president shall automatically become a director from the date of his retirement until the next Annual Meeting.

The Annual Nominating Committee elected by the directors at the Semi-Annual Meeting in Los Angeles (Div. 1, Page 5, Lines 84-89) respectfully submits the following qualified candidates for directorship for your careful consideration.

Please be informed, however, that should you feel that the Annual Nominating Committee has failed in selecting trained, experienced and qualified candidates which meet your approval, you may exercise the privileges to which you are legally entitled, by organizing a special nominating committee (The Procedures regarding the Special Nominating Committee, Div. 4, Page 3, Lines 63-93, which read as follows):

According to the Constitution, Div. 1, Page 5, Line 90, 20 or more senior members of the Society entitled to vote may constitute themselves a special nominating committee with the same power as the Annual Nominating Committee and subjected to the same procedures.

After the publication of the National Annual Nominating Committee's report, a chapter and or 20 members desiring to avail themselves of this privilege, shall prepare a petition as outlined in Articles 1-2-3-4-5 of Div. 4, Page 2, Lines 40 to 44, 66 to 77, together with all statistical and biographical information for each nominee as required. This should also include the nominee's willingness to accept the nomination, subject to possible election.

This petition, together with the required signatures, must be sent to the executive secretary who shall immediately distribute copies to all chapter chairmen signifying the intention of the Special Nominating Committee.

All special nominating petitions must be presented to the national office before February 1st of each year after which time special nominations shall be declared closed. No nominations for directors shall be accepted from the floor of the House of Delegates.

Such names submitted will be included on the printed ballots for the House of Delegates.

The members of the Annual Nominating Committee are unanimous in the recommendation that you carefully consider the following:

The American Society of Tool Engineers has now become a vital and recognized part of the American way of life. Its activities are multitudinous and varied. The national directors are your business representatives filling an important job with high responsibilities and without remuneration. On the directors' ability to function properly may depend the future of the profession of tool engineering and of your Society.

A director, therefore, should be thoroughly familiar with the work of all the committees, both chapter and national; have served as a chapter officer; thoroughly understand the Constitution, By-Laws and Procedures of the Society; and in addition, be a recognized and able business administrative executive.

CANDIDATES

Incumbent National Officers

R. B. DOUGLAS—1st v.-pres. and incumbent director, ASTE. Pres., Godscroft Industries, Ltd., Montreal, Que., Can. Senior member since 1942. A very active member of Montreal chapter, being a charter member and former 2nd and 1st

v.-chm. and chm. Has served as area v.-chm., National Standards Com., and chm., Honor Awards Com. Incumbent member, Handbook Com. and past chm., Committee on Professional Engineers. Past activities include service on Publications Com. and other special committees. Incumbent national director (4th term). Industrial administrative executive and engineer since 1938. Active in numerous technical and professional associations. Holds M.S. degree.

* * *

HERBERT L. TIGGES—2nd v.-pres. and incumbent director, ASTE. Exec. v.-pres., Baker Brothers, Inc., Toledo, Ohio. Senior member since 1936. Has served on National Editorial Com. Incumbent national director (2nd term). Wide and varied experience in responsible industrial positions. Director, National Machine Tool Builders' Association. Advisor and consultant to National Securities Resources Board, Washington, D. C., on machine tool work of Manufacturing Products Div. Director, Amtea Corp., New York City. Active in numerous technical, professional and civic organizations.

* * *

V. H. ERICSON—3rd v.-pres., ASTE. V.-pres. and sales manager, Johnson deVou, Inc., Worcester, Mass. Senior member since 1939. Active in Worcester chapter; a past chairman of chapter Editorial Com. Has been area v.-chm. (two terms) and past chm. of National Membership Com. Former member, National Finance Com. Past national treasurer (two terms). Outstanding authority on grinding processes.

* * *

W. B. McCLELLAN—National sec'y., ASTE. Engineer, Gairing Tool Co., Detroit, Mich. Senior member since 1935. In addition tc heading several Detroit chapter committees, he has been 2nd v.-chm., 1st v.-chm., and chairman of Detroit chapter. Former chm., National Program Com.; chairman, National Editorial Com. (two terms). Active in other technical societies.

G. A. Exley
Mem., Natl.
Membership Com.

R. W. Ford
Director

G. A. Goodwin
Natl. Treas.
Chm., Natl. Finance
Com.

F. C. Koehn
Former Mem., Natl.
Editorial Com.

GEORGE A. GOODWIN—National treas., ASTE. Chief process eng., Master Electric Co., Dayton, Ohio. Senior member since 1938, Charter member, former v.-chm., chairman and committeeman, Dayton chapter. National director (one term); past chairman and incumbent member, National Finance Com. Has served in engineering and executive capacities since 1910. Active in other technical and civic organizations.

Directors Nominated for Re-election

KARL L. BUES—Consulting mfg. eng., San Francisco, Calif. Senior member since 1939. Charter member, former sec'y. (two terms); v.-chm. and chm., Golden Gate chapter. Was also chairman of chapter Publicity, Editorial, Standards, Education and Program Coms. Acted as Western area v.-chm., National Industrial Relations Com. Serving second term as director. Industrial executive and tool engineer since 1923. Member, California State Board of Education Apprentice Training Com. Instructor in tool engineering and production engineering at University of California. A regular contributor to trade publications.

* * *

HAROLD E. COLLINS—Chief production eng., Hughes Tool Co., Houston, Texas. Senior member since 1939. Charter member and past chairman, Houston chapter. Serving 3rd term as director, Industrial executive and tool engineer. Active in other technical societies.

* * *

J. J. DEMUTH—Gen. supt., member of Executive Com., Sligo, Inc., St. Louis, Mo. Senior member since 1941. Has served as 2nd v.-chm., and 1st v.-chm., and chm., St. Louis chapter; v.-chm. and chm., National Constitution and By-Laws Com. Wide and varied experience in executive and responsible industrial positions. Registered Professional Engineer and member of other technical societies.

* * *

THOMAS J. DONOVAN, JR.—Owner, Donovan Co., Philadelphia, Pa. One of three organizers of Philadelphia chapter and active in all chapter affairs since. Senior member since 1938 and former chapter chm. Former member, National Constitution and By-Laws Com. Serving 2nd term as director. Active member, Philadelphia chapter, ASM; life member, Army Ordnance Assoc. and Franklin Institute. Wide industrial and executive experience. Active in other organizations.

* * *

ROBERT W. FORD—Asst. sales mgr., Machine Tool-Cutting Tool Div., Ex-Cell-O Corp., Detroit. Mechanical and industrial engineer. Experienced tool engineer. Senior member since 1938. Has held various offices in Pittsburgh chapter, culminating in chairmanship. Has been 2nd and 1st v.-chm., and chm., Natl. Program Com. Experienced administrator; active in other technical and social organizations.

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HENRY J. RICHARDS—Asst. to gen. supt., General Electric Co., River Works, Lynn, Mass. Senior member since 1940 and charter member, Boston chapter, serving as 2nd and 1st v.-chm. and chm. Past chm. of several Boston chapter coms., and present member of Advisory Board. Former area v.-chm., National Program Com. (two terms). Checking editor for Handbook. Graduate apprentice, tool and die making. Experienced industrial executive, active in technical and civic organizations.

Additional Nominees

LESLIE B. BELLAMY—District mgr., Detroit office, Sterling Grinding Wheel Div.,

J. A. Lapham
Mem., Natl.
Editorial Com.

A. D. Lewis
Mem., Natl.
Program Com.

W. B. McClellan
Natl. Secy.

H. C. McMillen
Past Chm., Dayton
and Evansville
Chapters

H. J. Richards
Director

M. L. Roessel
Former Mem., Natl.
Editorial, Education Com.'s

H. L. Tigges
2nd V.-Pres.
Director

W. L. Ulrich
Chm., Ind. Rel. Com.
Toledo Chapter

R. F. Waindle
Mem., Natl.
Finance Com.

Gardner Young
Mem., Natl.
Program Com.

Cleveland Quarries. Senior member since 1939. Has served as standards chm. and chm. of Detroit chapter. Past chm., Data Sheet Sub-Com. and incumbent chm., National Standards Com. Long experience in tool engineering with leading automotive company. Member, Engineering Society of Detroit and ASTE representative on Vocational Guidance Com., ESD. Active in other technical, professional and civic organizations.

* * *

JAMES C. COGBURN, JR.—Engineer, Williams Brothers Corp., Chamblee, Ga. Senior member since 1940. Has served as treas. and chm., Atlanta chapter; is chm., chapter Education Com. Has held varied engineering posts.

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GEORGE A. EXLEY—Chief of experimental eng. sect., Bendix Radio Div., Bendix Aviation Corp., Towson, Md. Senior member since 1942. Has served in several capacities in Boston and Baltimore chapters. Incumbent chm., Baltimore chapter and member, National Membership Com. (three years). Member, Institute of Radio Engineers. Wide industrial and executive experience. Graduate electrical and mechanical engineer.

* * *

FOSTER C. KOEHN—Plant eng., The Falk Corp., Milwaukee, Wis. Senior member since 1936. Past v.-chm. and chm., Milwaukee chapter. Former member National Editorial Com. Member, Engineering Society of Milwaukee. Has served in varied engineering positions.

* * *

JOHN A. LAPHAM—Process analyst, process eng. dept., Consolidated Vultee Aircraft Corp., Fort Worth, Texas. Senior member since 1942. Has served in numerous chapter capacities. Former director; incumbent chm., North Texas chapter, and member, National Editorial Com. Has held responsible positions in industry. Active in other technical and civic organizations.

* * *

ARTHUR D. LEWIS—Owner and manager, Art Lewis Production Equipment Co., Glendale, Calif. Senior member since 1942. Has served in numerous chapter capacities culminating in chairmanship, Los Angeles chapter. Present member, National Program Com. Wide industrial and executive experience. Registered Professional Engineer.

* * *

HOWARD C. McMILLEN—Gen. supt., Seeger Refrigerator Co., Evansville, Ind. Senior member since 1938. Past sec'y., v.-chm. and chm., Dayton chapter. Past chairman Evansville chapter. Has held responsible positions in industry. Active in other technical and civic organizations. Holds B.S. degree in Mechanical Engineering.

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MILTON L. ROESSEL—Partner, Rekers & Roessel Tool Engineering Service, Rochester, N. Y. Senior member since 1938. Sec'y., treas., 3rd, 2nd and 1st v.-chm. and chm., Rochester chapter. Previously member of National Editorial Com. (2 terms) and of National Education Com. (3 terms). Skilled in tool design, process engineering and supervision. Active in other technical societies.

* * *

WALTER L. ULRICH—Supt. of facilities, development, Willys-Overland Motors, Inc., Toledo, Ohio. Senior member since 1937 and charter member, Toledo chapter. Has held chapter offices culminating in chairmanship. Incumbent industrial relations chairman of Toledo chapter. Has held responsible positions in industry. Active in other technical organizations.

* * *

ROGER F. WAINDLE—Gen. mgr., Industrial Products Div., Elgin National Watch Co., Aurora, Ill. Senior member since 1945 and charter member, Fox River Valley chapter. Active in chapter affairs. Incumbent member, National Finance Com. and chapter chm. Has held responsible industrial executive positions. Active in other technical, social and civic organizations. Registered Professional Engineer. Holds B.S. degree in Mechanical Engineering.

* * *

GARDNER YOUNG—Tool supervisor, Westinghouse Electric Corp., Pittsburgh, Pa. Senior member since 1937. Treas., v.-chm., and chm., Pittsburgh chapter. Present member, National Program Com. Oustanding experience as tool engineer.

Mrs. N. R. Boynton, wife of the first vice-chairman of Fond du Lac chapter, draws a lucky number for a prize award at the chapter's ladies night. From left: Mr. Boynton, Mrs. J. P. Schommer, Mrs. Boynton, Beth Dailey (speaker), executive secretary of Oshkosh chapter, American Red Cross, and Jule P. Schommer, chapter chairman

Petroleum Research Calls for Mechanical Ingenuity

San Francisco, Calif.—Drawing upon many fields of engineering, petroleum research organizations are constantly working to develop new by-products and to find additional commercial outlets for the new materials.

R. Lannert Inglehart, chief engineer of the Shell Development Co., related interesting problems in this connection during an address November 16 before Golden Gate chapter.

Mr. Inglehart described the extensive work and laboratory facilities required in developing acetones, solvents, and synthetic ammonia for the chemical and plastics industries. The latter is a heavy user of petroleum chemicals.

The speaker displayed a large collection of mechanical devices needed in pursuing this research. Every type of shop work on all kinds of metals is processed in the laboratory shops. The work taxes the ingenuity of highly skilled mechanics.

Of extreme interest to the audience were the subsequent discussion and inspection of the exhibit.

A motion picture showing complete operation of the Bullard Man-au-Trol vertical turret lathe rounded out the technical program.

In the preceding business meeting Karl L. Bues, chapter member and national director, reported enthusiastically on the Semi-Annual Meeting at Los Angeles and the chapter's participation.

Efforts of the chapter Standards Committee in obtaining engineering data sheets for the Society were discussed by Carl S. Peterson, standards chairman. He appealed for member cooperation in securing names of interested companies.

Chairman Ernest Holden presided and introduced several new members and distinguished visitors, including Howard Merrill, sales director and assistant secretary, Brown & Sharpe Mfg. Co., Providence, R. I.; and R. C. Dickinson, production engineer of the Marchant Calculating Machine Co.

Ladies Night Features Japanese Travelogue

Fond du Lac, Wis.—ASTE wives were honor guests at the annual ladies night of Fond du Lac chapter, held November 12 at the Conway Hotel, Appleton. Approximately 120 members and guests were present.

Beth Dailey, executive secretary of the American Red Cross office in Oshkosh, addressed the group, giving a travelogue illustrated with her own color films made during and after the war, in Japan and other Pacific islands. They included views of modern buildings in greater Tokio, the Emperor's palace, Japanese shrines and temples, and picturesque mountains in northern Japan.

Each lady received an orchid flown from Honolulu, T.H.

Hardware Plant Credits World Markets to Tooling

Bridgeport, Conn.—Stressing the importance of tool engineering in modern industry, Yale & Towne Manufacturing Co. executives described manufacturing and distribution methods of their Stamford division to plant superintendents, engineers and master mechanics participating in the annual plant visitation of Fairfield County chapter, November 10.

During the afternoon, tours of the plant conducted by company engineers afforded guests an opportunity to view up-to-date methods employed in hardware manufacture.

A technical dinner meeting followed the afternoon session. A. Douglas Dalton, assistant general manager, welcomed Society members on behalf of the management, and other executives discussed operations at the Stamford plant.

Speaking on the subject, "Manufacturing Methods," Harold E. Nagle, general superintendent, described the continuous study conducted by Yale & Towne to improve product design and manufacturing methods. He used a pin-tumbler cylinder lock as an example, pointing out recent advances made in its manufacture through the use of new, especially designed machinery.

In describing plant products, which include locks, builders' hardware, door closers and tri-rotor pumps, Meade Johnson, general sales manager, told the tool engineers that he had to "pay tribute to modern tooling which makes the world-wide distribution of Yale products possible."

Resumes Eng. Service

Chambersburg, Pa.—R. E. W. Harrison, vice-president of Chambersburg Engineering Co., has resigned to re-establish his consulting service with headquarters to be set up in New York City. He will specialize in management engineering.

A registered Professional Mechanical Engineer, Mr. Harrison is a member of Potomac chapter, ASTE, and of several other professional organizations both in the United States and abroad. He is a commander in the U.S.N.R.

During tour of Yale & Towne plant at Stamford, Conn., Fairfield County members hear F. E. Karl (right), assistant to superintendent of press, rod and forge shops, explain how a large press, performing eight operations simultaneously makes escutcheon plates they are holding

Lysaght Compares Hardness Testers, Indicates Trends

Poughkeepsie, N.Y.—"Current Trends in Hardness Testing" was the subject of a talk by Vincent E. Lysaght, sales manager of the Wilson Mechanical Instrument Co., before approximately 50 members and guests of Mid-Hudson chapter, November 9.

Most common hardness testing instruments, Mr. Lysaght stated, are the Brinell, Sclerescope, Vickers and Rockwell. He illustrated each with slides and described their operating principles.

The Brinell tester uses a 3000 kg. load to apply indenture with a 10 mm. steel ball. Diameter of the indenture is measured and, by reference to charts, the hardness for the measured diameter is obtained. This tester is well adapted to large parts and those where a deep indenture is permissible.

Diamond Pyramid Used in Research

Similar to the Brinell is the Vickers or diamond pyramid test, employing a square base pyramid diamond penetrator. Dimension of the impression is read under a microscope and hardness value ascertained from a chart. Since it requires careful preparation for a test, the machine lends itself to research work and odd-shaped pieces.

The Rockwell tester uses a 120 deg. diamond Brale penetrator, applied to the work with a minor load of 10 kg. followed by a major load of 60, 100 or 150 kg., depending on metal under test and penetrator used. Rockwell hardness is based on the difference in penetration between the light and heavy loads. It is suitable for testing general small parts.

Based on a similar principle, the Rockwell superficial tester uses a minor load of only three kg. and a major load of 15, 30 or 45 kg. Due to the shallowness of the indenture, this tester is ideal for thin materials.

As hardness testing became more valuable to engineers, a need was expressed for a means of checking thin materials where a shallow indentation was of prime importance. To meet this requirement, the micro-hardness testing method was developed.

Employing a diamond-shaped Knoop indenture, the instrument makes a long, shallow indentation, the length being 30 times the depth. Length of the indenture is measured under microscope and hardness number is found on a chart.

With this instrument depths of thin and heavy cases may be measured, decarburization studies and testing of metal constituents may be made. It is also possible to test hardness value at the very edge of cutting tools. Hardness of chips produced by a cutting tool also can be checked, demonstrating that a chip from soft steel increases in hardness approximately 300 per cent, approaching the hardness of the cutting tool, said Mr. Lysaght.

Robert Ohlman of the New York State Conservation Department gave a coffee talk before the technical session.

During a business session, Ellis Thorp, education chairman, was elected second vice-chairman to complete the unexpired term of Fred J. Neumann, who resigned due to pressure of business.

John Petz reported on his visit to the ASTE semi-annual meeting at Los Angeles. Presiding officer was L. H. Tenney, chapter chairman.

Tells How to Select Proper Cutting Fluids

Toledo, Ohio—C. B. Harding, technical representative of the industrial products dept., Sun Oil Co., advised Toledo chapter "How to Determine the Correct Cutting Fluid for the Job."

Appearing before 74 members attending a chapter meeting November 10, Mr. Harding showed a film of processing oils and greases from oil well through refinery. Of particular interest was the close laboratory control held over the product.

Mr. Harding classified cutting fluids as emulsifying and straight oils and listed their functions as lubrication, cooling, and mechanical removal of chips. Practical testing of cutting oils on production runs at Sun Oil has helped greatly in their understanding of the problem. In these tests oil composition is varied and horsepower consumption and work-piece temperature measured to provide valuable data.

A series of slides of machining operations was shown. The speaker commented on each, naming the type of oil used and explaining how composition was varied to obtain specific properties.

Selection of the correct fluid for a particular job, said Mr. Harding, is not an exact science but an empirical art. Though certain factors may be known, the correct proportion of variables should be worked out by close cooperation of tool engineer and supplier.

Milton J. Steffes (right) of Super Tool Co. receives congratulations of A. R. Conrad, chairman, Detroit student group, on talk concerning inserted carbide cutters

Inserted Carbide Cutter Pays Off in High Output

Detroit, Mich.—Milton J. Steffes, assistant sales manager and research engineer, Super Tool Co., Detroit, addressed a recent meeting of the Detroit College of Applied Science section of Detroit chapter.

Mr. Steffes spoke on "Advantages and Economy of Using Unbrazed Carbide Inserts in Ejector Type Holders," illustrating his talk with a slide film. He discussed both straight and offset inserted cutters, comparing them to conventional brazed carbide cutters.

While the inserted carbide type is somewhat more expensive in first cost than the conventional tool, Mr. Steffes pointed out that, in the number of pieces per grind, the insert type shows marked economy. Since the insert may be indexed, turned end for end or replaced by a new insert without disturbing the setup, there is added saving in reduction of down time.

The speaker went on to explain applications and drawbacks of the four available carbide forms—round, square, triangular and rectangular.

At the conclusion of his talk the meeting was thrown open for discussion.

Chairman A. R. Conrad introduced and thanked the speaker.

Glass Insulation Resists Atmospheric Deterioration

Richmond, Ind.—Owens-Corning Fiberglas Corp. presented "Watts in Glass" before a meeting of Richmond chapter, November 9.

Laboratory experiments and fabrication processes for glass products were shown in a film. Emphasis was on electrical wire insulation in applications where extreme heat, moisture or corrosive elements would cause early breakdown of organic materials.

Another recent development depicted was the fabrication of glass yarn for fireproof draperies and cloth automobile tops.

The lecture and discussion period centered around a display of glass items.

High Precision, Keynote Of Watch Plant Tour

St. Charles, Ill.—November meeting of Fox River Valley chapter was held on the 2nd at the Elgin Watch Co. plant in Elgin.

The meeting opened with a trip through the plant, each small group of visitors being escorted by a company engineer to explain processes employed in making fine timekeeping devices. Of particular note were the small size of the production parts, the very close tolerances and high finishes, maintained as a matter of everyday necessity.

After the plant visit the members gathered in a conference room and watched a film on development of the alloy used in the Dura-Power mainspring, standard in Elgin time pieces.

George Ensign, director of research, commented briefly on industrial contributions of the watch industry through the centuries. Some of the most common production tools and materials, he revealed, owe their origin to the exacting requirements for better timekeeping devices. Many famous scientists of the past two centuries were motivated largely by problems presented in producing dependable time measuring devices.

Engineering phases of watch making were described by several department heads. N. K. Perkins, chief product engineer, discussed design; production and quality control were the theme of E. H. Schaefer, chief production engineer; while the building and use of tools upon which modern production is based were related by D. E. Zierk, chief tool engineer.

Roger Waindle, chapter chairman, expressed the group's appreciation for a stimulating and instructive program.

Broaching Seen in Films

Cedar Rapids, Iowa—K. N. Macomber, chief engineer of Lapointe Machine Tool Co., Hudson, Mass., addressed the November meeting of Cedar Rapids chapter.

Two technicolor films, "Jet Propulsion and Its Tooling Problems" and "Latest Development in Surface Broaching," illustrated broaching operations. Unusual and efficient work-holding fixtures also were explained in motion pictures.

Prompt response from the group resulted in a lively question period.

Following a tour of the Elgin Watch Co. plant, Fox River Valley tool engineers hear company executives lecture on precision engineering phases of watchmaking

Miracle of Television Reduced to Lay Terms

Flint, Mich.—Principles of television were simplified for Flint chapter members in a fascinating talk by W. J. Banks, customer relations assistant for the Michigan Bell Telephone Co. Mr. Banks gripped his audience at a recent chapter meeting with a description of the operation of video and its future possibilities.

A business meeting and dinner preceded the technical session. To spur its membership campaign, the chapter will award a complimentary dinner to each member bringing in two new ASTE'ers.

During the evening the chapter's annual scholarship awards were presented to high-ranking students taking tool, die and processing courses at General Motors Institute and cooperating in Flint or Saginaw plants.

Roy Eifler and Robert Stoathoff of Fisher Body Flint Div., and Robert Smith of the AC Spark Plug Div., General Motors Corp., all juniors at the institute, won a year's membership in the chapter.

Charles Bierwith, fifth year graduate with a degree of Industrial Engineer, cooperating with Buick Motor Div. of General Motors, was awarded a year's membership, an ASTE pin, and a season dinner ticket.

Situations Wanted

METALLURGICAL ENGINEER — Age 39, 12 years' experience with tool steel manufacturer in laboratory and metallurgical service work on tool and high-speed steels. Four years as metallurgical engineer for high-speed tool manufacturer. College graduate. Position in Midwest or East preferred, but will consider other locations. Please reply to Box 157, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

PRODUCTION OR MANUFACTURING ENGINEER—Desires permanent position with progressive company using machine tools. Practical engineer, age 49, married, 28 years' broad shop and tooling background, quality control, methods, tool supervision, production engineering, tool inspection, and machine and tool repair. Keen knowledge of single purpose tooling for mass production. Complete resume on request. Salary open. Address replies to Box 156, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

Jurist Says Survival Hinges on World Unity

Kansas City, Mo.—Approximately 85 members and guests of Kansas City chapter attending Executives Night at the Advertising and Sales Executives Club November 3, heard Robert McNair Davis, D. J., Ph.D., professor of international law at the University of Kansas, expound the "Impact of Technology on World Affairs."

Dividing the history of communication and transportation into four periods, Dr. Davis stated that little progress was made during the period ending about 1776. The Age of Steam began with Watt's discovery, followed by experiments with electricity.

Invention of the Diesel engine with internal combustion brought another great contribution in the use of power. The Atomic Age, which we are now entering, promises countless new wonders.

Cannot Be Self-Sufficient

No nation, Dr. Davis emphasized, can satisfy its people's wants within its own borders. The world has become an economic unit. In order to survive, it must be a political unit.

Discussing "Whither Tool Engineering," O. W. Winter, president of Acme Industries, Buffalo, N. Y. and a former ASTE president, stressed the trend of industry to accept automatic equipment to offset increasing costs of materials and labor. This is a challenge to the tool engineer's creativeness in devising workable machines. The recent world conflict, Mr. Winter pointed out, demonstrated the tool engineer's ingenuity, amazing both ourselves and our enemies.

Attendance included about 20 engineering students from the University of Kansas ASTE student chapter. Faculty members accompanying them were: Dean T. Dewitt, School of Engineering and Architecture; Prof. H. L. Dassch, chairman, Department of Mechanical Engineering; Prof. Albert Parmalee, chairman, Department of Engineering Drawing; Prof. Paul G. Housman, director, and Prof. Howard Rust of the Department of Shop Practice.

Manages Detroit Office

Detroit, Mich. — Appointment of Samuel J. Matchett as manager of the Detroit office of Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn., has been announced by the company.

Mr. Matchett will head machine tool sales in Michigan, succeeding the late H. William Kopf. A member of Chicago chapter, ASTE, Mr. Matchett has been in the Pratt & Whitney office in that city since 1923.

Utica to Have Chapter

Utica, N. Y.—Chartering of a new ASTE chapter, to be known as Mohawk Valley chapter, is tentatively scheduled for January 25.

The Utica area group will be the 78th to be chartered by ASTE. Ernest J. Masucci of the New York State Institute of Applied Arts and Sciences is serving as temporary chairman.

Center: A group of the 180 Rockford area tool engineers and their guests who turned out to hear Alexander Bryant (left), retiring president of the National Machine Tool Builders' Association, tell of conditions abroad, and H. L. Tigges (right), second vice-president of ASTE, who commented on significance of tool engineering in America

Finds European Industry Can't Get ECA Funds for Tools

Rockford, Ill.—European recovery and American prosperity are indisputably interwoven and are dependent more upon increased production than any other factor. So stated Alexander G. Bryant, retiring president of the National Machine Tool Builders' Association, in an address November 7 before Rockford chapter.

To give a clearer picture of the situation, Mr. Bryant presented problems confronting Europe, based on a recent business trip abroad.

Food Takes Most of Income

Finding conditions in hotels of the large cities misleading, he toured the working districts. Without too much searching he found bread lines, and people rooting in garbage cans. The average worker uses 80 per cent of his monthly wage for sufficient food to sustain life. Other shortages, such as steel and coal, have stagnated industry.

There is a definite need for good political leadership, Mr. Bryant declared. The people hope for a change of government. By creating chaos the Communists will drive the masses to grasping at anything for survival, thus fostering the spread of this subversive ideology.

Continued concentration on relief measures may stymie economic recovery which is the goal of the entire Marshall plan program. Not many Americans realize, he added, that foreign governments participating in ERP are the real directors of that program rather than Paul Hoffman.

Would Welcome U. S. Supervision

Many Europeans with whom Mr. Bryant talked could not understand why the American government was not indicating where and how ECA money should be spent. The basic ERP policy should be re-examined, he believes, to correct existing faults, such as ECA's refusal to influence local governments in their programs of rehabilitation.

The committee for analyzing European recovery needs overlooked one item important to achieving prosperity and a better standard of living. While Europe needs machine tools, he pointed out, and the American machine tool industry needs the European market, negotiations are proceeding very slowly.

Mr. Bryant declared that there are machine tool orders for $150 million resting on desks in Europe. But the orders haven't been approved because the ECA money was allotted for other purposes. These tools are available for almost immediate shipment from the United States and without straining America's supply of steel.

At the conclusion of Mr. Bryant's talk, the audience of 180 members and guests gave him a standing ovation in appreciation. The floor was then open for questions concerning his address.

H. L. Tigges, second vice-president of the Society, brought a greeting from the national organization and remarked on the importance of tool engineering in the overall picture of production so important to the American way of life. Chairman Howard Nelson presided.

High Speed Film Reveals Cutting Action Detail

South Bend, Ind.—A visual analysis of cutting edges was presented to South Bend chapter recently in ultra high speed motion pictures exposed at a rate of several thousand frames per minute.

Shown by P. F. Rehner, carbide die engineer of Allegheny Ludlum Steel Corp., the film illustrated his lecture, "Lamination Dies and Their Manufacture."

While the film unreeled in relatively slow motion, it was possible to see metal slowly peeled away as the tool moved along by jerks. When oil was applied to the cutter and work, a strange phenomenon resulted—lines developed similar to those produced by the use of polarized light and plastic models.

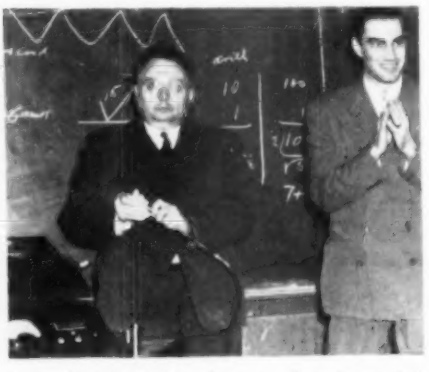
As further illustration Mr. Rehner exhibited slides showing the use of high speed carbon tool steels and carbides in lamination dies. Dies developed for lamination work are of an ultra precision quality frequently having only .0002 in. clearance between punch and die.

The taper is so small that often 80 per cent of the die is ground away in sharpening before the tool is worn out. An unusual feature is that the stripper plate floats free and is guided on to the leader pins.

His company, the speaker said, builds dies only for its own use and uses carbides in every possible location because of the increased life span. When ordinary tool steels would last for only about 80,000 parts, carbide dies will produce 1,000,000 pieces.

One of the problems encountered in using carbide dies, Mr. Rehner warned, is that special anchoring means must be provided since the carbide itself cannot be tapped.

W. J. Gamble (right) of the Carrier Corp. explains factory equipment during Syracuse chapter tour of plant, while R. W. McLaughlin (center), also of the Carrier staff, and Lester Collins, chapter chairman, look on



A. R. Conrad (right), chairman, Detroit student group, leads applause as E. J. Abbott of Physicists Research Co. concludes demonstration and discussion of surface measuring equipment before meeting of student engineers

Students See Measuring Of Surface Finishes

Detroit, Mich.—Speaker at the November meeting of the Detroit College of Applied Science section of Detroit chapter was E. J. Abbott, manager of Physicists Research Co., Ann Arbor.

Mr. Abbott opened his talk by reviewing man's progress in gaging production parts with increasing accuracy. But despite improved gages and gaging methods, he said, it was not until 1929 that anything was done about measuring surface finish. In that year relatively identical devices for measuring finish were developed independently in both America and Germany.

Mr. Abbott illustrated his lecture with slides, clearly depicting schematic diagrams and pictures of the original equipment. Humorously he related some trials and tribulations of early work in this field.

In contrast he demonstrated one of the latest models for measuring surface finish.

Approximately 50 members were present and entered into the question and answer feature. The showing of a motion picture concluded the program.

Transferred to Chicago

St. Louis, Mo.—James G. Miller of St. Louis chapter, ASTE, has been transferred to the Chicago office of Vanadium Alloys Steel Co.

Straight Line Production Applied to Custom Business

Syracuse, N. Y.—Some 300 Syracuse members and their friends enjoyed the hospitality of the Carrier Corp. November 9, at a dinner meeting and tour of the company's recently acquired Thompson Road Plant.

R. W. McLaughlin, director of development centrifugal refrigeration, prefaced his remarks on "Pioneering in Centrifugal Refrigeration Equipment" with statistics about the plant, built and equipped by the government in 1942 for the manufacture of high speed turbines for the Navy.

In this plant Carrier builds a varied line of large refrigeration units for industrial application. Although manufacturing is on a more or less custom basis, ordinarily calling for job shop methods, machine tools are arranged for "progress through" production.

Huge cylinders, welded assemblies and sub-assemblies enter the machine shop at strategic points and move along through the sequence of operations toward a common goal.

With abandonment of departmental layout, material handling costs have been greatly reduced and "joy rides" of large castings up and down the shop are a thing of the past.

W. J. Gamble of the factory engineering staff set forth economic, technical and personnel aspects of "Problems of the Press Shop and Related Equipment." To operate at a profit, he said, technical problems must be solved in an economical manner by investigation of methods and by placing good tools and equipment in the hands of competent personnel.

In this scheme of operation, the tool engineer is an important factor. Without his basic work much time would be lost by the old "cut and try" shop methods.

Mr. Gamble described the evolution of the plant press shop from a crowded job shop, operating at maximum handling costs, to the present modern layout.

Large presses are arranged in two lines of six, one keyed to a 400-250 ton double action mechanical press and the other to a 400-200 ton double action hydraulic. Thus each line can be used in full or in part to completely process a piece.

Small portable presses can be moved in or out of these two lines for intermediate operations where necessary.

Mr. Gamble concluded his remarks with an invitation to tour the plant.

Aircraft Engineer Tells Benefits of Shot Peening

Newark, N. J.—Northern New Jersey chapter celebrated its eleventh anniversary in November with a program devoted to shot peening. Speaker of the evening was John Epprecht, production engineer, propeller parts, Curtiss-Wright Corp., and a chapter member.

Mr. Epprecht's address to 200 members and guests embraced air- and centrifugal-actuated shot peening, its equipment, tooling, and relation to engineering products design.

Shot peening he described as a cold-working method accomplished by pelting the surface of a metal part with round metallic shot thrown at relatively high velocity. Each shot acts as a tiny ball peen hammer, denting the surface and stretching it radially as it hits.

The rain of shot causes a plastic flow of surface fibers beyond their yield point in tension in a layer that extends .005 in. to .030 in. below the surface.

Mr. Epprecht also informed the group of the benefits of shot peening as affecting fatigue resistance, stress corrosion cracking, porosity in metals, silver plate testing, lubrication properties and economy. Since there are no standards, he added, each job must be treated individually.

* * *

A slide lecture on optical comparators and projectors was the technical feature of an earlier meeting. Willis DeBoer, plant and sales manager of Engineers Specialties Div., Universal Engraving and Colorplate Co., Buffalo, N. Y., presented the subject.

Jig Boring Efficiency Demonstrated in Film

Pittsburgh, Pa.—More accurately located, aligned and shaped holes in gear cases manufactured here and abroad, than those produced with drilling jigs and fixtures, are claimed for their jig borers, by C. E. DeVlieg, president, and R. H. Smith, sales manager, DeVlieg Machine Co.

They gave 128 Pittsburgh members and guests a highly educational account of this method of precision boring and automatic locating as the technical feature of a chapter meeting, November 5, in the Fort Pitt Hotel. Other advantages named were speed in production and elimination of scrap. Mr. Smith assisted Mr. DeVlieg by operating the slide projector.

In the absence of Chairman Risser, First Vice-Chairman Frank T. Boyd conducted the meeting. Second Vice-Chairman G. C. Wood introduced the speaker.

Chapter members R. W. Ford, a national director, and Gardner Young of the National Program Committee reported on the Los Angeles convention.

Arrangements for the Annual Meeting scheduled for Pittsburgh in March were also discussed.

G. E. Promotes Richards

Boston, Mass.—Appointment of Henry J. Richards as assistant to the general superintendent has been announced by Kenneth A. Munson, general superintendent of the River Works, General Electric Co., West Lynn, Mass.

In his new position, Mr. Richards will coordinate manufacturing operations of contributing divisions and direct their quality control and manufacturing loss programs. He was formerly superintendent of inspection.

A national director of ASTE, Mr. Richards is also a past chairman of Boston chapter.

Committee Heads Conduct Toronto Chapter Meeting

Toronto, Ont.—Establishing an innovation at Toronto Chapter, committee chairmen took charge of all activities for the November 3 dinner meeting in the Oak Room of the Union Station.

Vice-Chairman Fred R. Crook presided, while Chairman John Lengbridge sat in the audience. Each chapter committee, represented by its chairman or vice-chairman, reported on the scope of its efforts.

M. H. Lafete, vice-chairman of the Education Committee, announced that the quota for the punch and die design class in the chapter's educational course had to be extended from 50 to 60. There is still room for new students in the class on tool design. Classes are held in the Ryerson Institute of Technology, which also teaches day and evening courses in machine shop and allied subjects.

Speaker of the evening was H. B. Chambers of Atlas Steels, Ltd., Welland. He laid down six fundamentals guiding the choice of tool steels for a given service. They are: mass, ratio of section area to surface area, angularity and abruptness of shape changes, ratio of cross-section to length, ratio of cross-section to circumference, and change of section between one area of the die and another immediately adjacent. The latter item includes location of holes, whether near one edge or a uniform distance from all edges.

These factors, the speaker emphasized, all have a bearing on whether or not all parts of the die quench at a uniform rate. When there is non-uniformity in cooling rate during quenching, the change to oil-hardening or in more extreme cases air-hardening steel becomes more important.

Depending on whether a die is simple, complex or very intricate, Mr. Chambers recommended water-hardening, oil-hardening or air-hardening steel.

A color-sound film showed the manufacture of tool steels at Atlas and applications in Canadian plants.

Advises Standardizing Inserted Blade-Cutters

Louisville, Ky.—Frank Burgan, vice-president in charge of sales for Weddell Tools, Inc., was principal speaker at a dinner meeting of Louisville chapter held at the Kentucky Hotel, November 10. Mr. Burgan's topic was "Standardization of Inserted-Blade Milling Cutters."

He recommended standardization of main location angles in tool bodies, varying rake and clearance angles on tool bits to meet conditions caused by the materials being machined. Methods of holding bits in the bodies were fully discussed, and designers were cautioned that numerous failures result from faulty design. The speaker dwelt at length upon savings effected in plants he had contacted by standardizing tool bit sizes.

The question and answer period enabled members to bring their problems to an open forum. Twenty-eight were present for the dinner meeting, and 52 attended the technical session.

Prominent in forum, jointly sponsored by Rochester chapters, ASM and ASTE, are from left: L. K. Marshall of Delco Appliance Corp., R. V. Adair, Gleason Works, J. A. Larson, Eastman Kodak Co., and Guido Palma, ASM chairman

ASM-ASTE Thresh Technical Problems in Forum

Rochester, N. Y.—A forum, jointly sponsored by Rochester chapters ASM and ASTE was presented November 8 in Lower Strong Auditorium at University of Rochester.

William J. Conley of Carpenter Steel Co., serving as moderator, described the panel discussion as a four-ring circus and introduced each speaker as a "ringmaster."

Justus A. Larson, metallurgist at Camera Works, Eastman Kodak Co., lectured on "Proper Selection of Materials for Tools." He emphasized as important considerations in selecting tool materials: machineability, tool life, hardening hazard, toughness, and distortion.

It must be impressed upon the tool designer, said Lloyd K. Marshall, metallurgist at Delco Appliance Corp., that he has a metallurgical problem. Mr. Marshall discussed heat treating methods and reasons for using them.

Stress Leads to Distortion

"Factors Which Minimize Distortion and Breakage" was the subject chosen by Robert V. Adair, metallurgist at Gleason Works. He advised sticking to fundamentals. Distortion, he stated, is caused by stress, often set up prior to heat treatment. Therefore, reduction of stress eases strain, which is distortion.

In demonstrating "Unusual Fixture Design," Emmett W. Moore, chief tool engineer of Taylor Instrument Co.'s, assisted by Jack Lawrence of the Ritter Co., used large blackboard drawings. Through discussion and illustration he showed the accomplishment of a seemingly impossible problem in machining a hole, on a production basis, to .0002 in. tolerance, .170 in. in diameter by 2¼ in. deep, and held in relation with the outside.

The actual application produced the mechanism with which a dentist holds burrs for drilling teeth, allowing quick changing of burrs.

In approaching the designing of a tool, Mr. Moore advocated a positive viewpoint, with utmost efficiency in cost and use of the tool in production as a goal. Also to be considered are steel, heat treatment and adaptability, he reminded.

As each speaker concluded, Mr. Conley summarized his talk. A question and answer period followed with Mr. Conley selecting a member of the panel to answer each question. Featuring of local talent on the program heightened audience interest in the outstanding presentation. Combined attendance of the two societies totaled 140.

Guido Palma, ASM chairman, welcomed the group and introduced H. O. Simon, ASTE chapter head, who responded to Mr. Palma's greeting.

Vern Patterson, ASM education chairman, outlined coming meetings of that organization, extending a cordial invitation to the tool engineers.

Shows Handling Methods

Windsor, Ont.—Glen R. Johnson, Jr., of the Clark Equipment Co., Industrial Truck Div., Battle Creek, Mich., addressed a meeting of Windsor chapter, held November 8 in the Prince Edward Hotel.

Mr. Johnson traced the development of material handling methods with particular reference to industrial trucks. Three supporting films showed a wide variety of material handling operations as performed with the conventional fork truck, as well as accessory equipment developed for specific applications.

Chairman Alfred Hodgins presided at the dinner meeting.

Among new members introduced at recent meetings are: O. J. Peverall, H. M. Macdonald, M. J. Kuhn, D. J. Crumb, E. A. Aldous, A. Underwood, Jr., and E. A. Haigh.

Opens Engineering Office

Long Island City, N. Y.—Orest A. Meykar of Greater New York chapter, ASTE, has announced the opening of an office at 2817 Astoria Blvd., Long Island City 2, N. Y., to handle general production mechanization problems. He has been associated with the American Machinery and Materials Co.

Mr. Meykar is a licensed Professional Engineer in the State of New York, a member of ASME, SAE, the American Ordnance Association and of the American Society for Experimental Stress Analysis.

Pontiac Host to Ladies And Neighboring Chapter

Pontiac, Mich.—More than one hundred tool engineers and their guests participated in Pontiac chapter's first Ladies Night, held November 20 at Henry's. The chapter was also host to a large group from Detroit chapter and staff members from the national office of the Society.

Andrew E. Rylander, technical editor of *The Tool Engineer* was the speaker of the evening. All the inventive and production genius of American engineers, said Mr. Rylander, isn't enough to ease the strain on our present world civilization. We still need a contagious epidemic of good fellowship, understanding, tolerance, trust and a helping hand working in all directions throughout the world.

Peace, Greatest Potential Wealth

The greatest wealth we can build, he stressed, is the economy of peace. Technical societies, Mr. Rylander feels, can help effect this end because of the innate morality and decency in such groups.

W. B. McClellan, national secretary, spoke briefly about the Society, its position as a big business enterprise, and urged support of its activities.

Grant S. Wilcox, Jr., national director, presented a past chairman pin to Albert Rhodes, immediate past chairman, and introduced a number of Detroit guests.

Among these were: J. A. Siegel, first president of the Society; Andrew Carnegie, chairman; M. O. Cox, first vice-chairman; Andrew Grant, secretary; C. Granville Sharpe, Jr., treasurer; Leonard Kiefel, editorial chairman; E. Wayne Kay, George Hornett and John Muldoon, all of Detroit chapter; John S. Eacock, national office manager; and Doris B. Pratt, *ASTE News* editor of *The Tool Engineer*.

Local Industry Represented

Eldon Hall, chapter chairman, presided and presented his officers and local guests, including Harry Yeager, Manager of Plant 1, GMC Truck and Coach Div.; Marcus Scott and John Becker, production superintendents for Mr. Yeager; A. H. Hoffman, master mechanic at GMC Truck and Coach Div.

Charles Staples of Birmingham, first chairman of the chapter; Joseph Atwell of GMC Truck and Coach Training School; and William McLaughlin of Pontiac Motors Trade School. Most of the guests were accompanied by their wives.

George Pudduck, program chairman, accompanied by Lydon Salathill, rendered several vocal selections and led group singing. Mr. Salathill also obliged with piano solos. Harold Geggie, constitution and by-laws chairman, offered the invocation before dinner.

The meeting was the first of a series which the chapter hopes to initiate with neighboring ASTE groups.

The event also marked the conclusion of a successful two-months' membership contest conducted by Ivan D. Woodhull, membership chairman. The losing team is presenting ASTE pins to 35 new members gained during the campaign.

Atlanta Engineers View Electric Motor Manufacture

Atlanta, Ga.—November 15 meeting of Atlanta chapter began with dinner at Georgia Tech banquet hall, followed by a tour of the Westinghouse Electric Corp. manufacturing plant and repair station on Northside Drive.

Charles F. Bolden, Jr., first vice-chairman, introduced Charles Dusenberry, Westinghouse representative, who briefly outlined points of interest to be included in the tour, and his subject, "Industrial Electronics," for the subsequent technical session.

At the Westinghouse plant R. C. Black, sales promotion manager for the Atlanta branch, greeted the ASTE members and guests.

Guides led the way through the offices and engineering department to the plant itself. First stop was to watch the repair of fractional horsepower electric motors.

Services Electric Power Equipment

Next were large motors, generators and drive units for Diesel-electric locomotives, and power plant equipment. Leaving the motor section, the group visited the transformer repair and manufacturing department. Here all types of transformers, from small pole units to substation giants of 5,000 kva capacity, could be seen in various stages of completion.

Then came the machine shop and fabricating section, capable of any operation necessary to the production or repair of electrical equipment. Switch gear, cubicle, and bus-bar assembly were shown in progressive stages.

After reassembling in the conference room, the engineers saw two films dealing with induction heating and dielectric heating. Basic principles of these methods were discussed in the motion pictures. Sequences showed actual examples of time and material saved through proper tooling and application of these production processes.

Mr. Dusenberry explained how furniture and radio cabinet plants in the area use dielectric heating for glue drying. Slides illustrated the ingenious tooling developed by these manufacturers and Westinghouse for speed and efficiency in cabinet assembly and glue setting.

Both speakers answered a number of questions from the audience.

Plastics Industry Needs More Tooling Specialists

New York City—There is an enormous field for tool engineers in designing tools and injection molds for the plastics industry, since 90 per cent of the equipment used in manufacturing plastics consists of tools and molds, a field confined to a few specialists.

Islyn Thomas, president of the Thomas Manufacturing Corp., Newark, N. J., and author of "Injection Molding of Plastics," emphasized this point during an address before the November meeting of Greater New York chapter. More specialists, he urged, should be trained to design tools for plastics. But the average designer with no conception of designing tools or injection molds should not venture into this field.

Manufacture of plastics production equipment, he advised, should be farmed out to specialists instead of having plant engineers unacquainted with this product make costly experiments.

Mr. Thomas appealed to the tool designers and specialists present to improve designs to produce plastics economically.

The entire talk was illustrated with slides showing processes in the manufacture of plastics.

E. W. Spitzig, chief engineer of the Newark Die Co. of Newark, N. J., assisted Mr. Thomas.

William Lentz, chapter chairman, presided. Julius Schoen, program chairman, and his committee handled arrangements.

Among Detroit visitors at Pontiac chapter's first ladies night are, from left, standing: A. E. Rylander (speaker), technical editor of THE TOOL ENGINEER; G. S. Wlcox, Jr., national director; W. B. McClellan, national secretary; Andrew Carnegie, Detroit chapter chairman; J. S. Eacock, ASTE office manager; (seated): Eldon Hall, host chairman; D. B. Pratt, ASTE News editor, THE TOOL ENGINEER; and J. A. Siegel, first Society president

Wheel Selection Vital to Success in Crush Dressing

Montreal, Que.—Greatest single factor in the successful application of crush dressing is selecting the right grinding wheel, according to J. C. Wilson, chief engineer and sales manager, Thompson Grinder Co., Springfield, Ohio, who lectured on "Crush Grinding" at the November 11 meeting of Montreal chapter in the Canadian Legion Memorial Hall.

Mr. Wilson, an expert and author on the subject of crush dressing, emphasized the difference in structure of wheels used in crush dressing and grades employed for diamond dressing.

No Elaborate Equipment Needed

Much finer grits and more open bonds should be used, said the speaker, and experience proves that grits of about 300 mesh size with "G" or "H" bonds are best for average operations using the crushed-wheel method of grinding. In describing the process, Mr. Wilson pointed out the simplicity of tools and equipment required. A crusher roll is made, similar to a circular forming tool, he explained, and is turned on a lathe to the shape to be ground in the workpiece. The roll is usually of high-speed steel, although other metals such as cold-rolled steel, cast iron and brass have been used successfully.

The finished crusher roll is generally mounted on anti-friction bearings that allow no end play. It is attached to the grinding machine table by any suitable method permitting the roll to be moved slowly towards the wheel or the wheel towards the roll. Axis of rotation of the crushing roll should be parallel to that of the grinding wheel. Roll or wheel should be rotated at a peripheral speed of approximately 250 to 300 sfpm.

While rotating, the axes of the two are slowly brought together so that grit is removed from the wheel by the crushing action of the roll until the shape of the roll is duplicated accurately in the periphery of the wheel.

Use Second Roll for Retouching

For production work, the speaker advocated using two rolls, one to crush the wheel and the other as a transfer roll for subsequent "retouching" of the wheel to hold accurate shape. Both rolls should have exactly the same contour. Initial crushing should be at the rate of about .001 in. removal per pass and subsequent retouching at a few tenths of a thousandth.

A film, and sample parts ground by this method, showed the high speeds at which metal can be removed from hardened steel parts of intricate shape, how the process gives faster, more accurate cutting action, and saves time and effort in dressing.

According to Mr. Wilson, it is now common practice to remove as much as ⅛ in. in one pass on high-speed and high carbon-high chrome steels.

It was announced that the Education Committee plans to issue a questionnaire to poll members concerning a suggested series of round table discussions.

Nearly 800 Merrymakers Crowd Detroit Christmas Stag

Top: Anticipating an evening of fun and good fellowship, these Detroiters line up to enter annual Christmas stag party. Below: Inside, some of the nearly 800 members and friends who taxed capacity of local restaurant, make merry while waiting for dinner. Entertainment and attendance prizes added to the festivities of the social event

Broaching Expert Cites Tools as Key to Progress

Elmira, N. Y.—Cautioning that "the tools we make are a measure of our responsibility," Norman H. Iversen, chief engineer, Michigan Broach Co., Detroit, Mich., told Elmira members at a chapter meeting December 6 that this country has progressed due to work tools.

Speaking before a blackboard, Mr. Iversen sketched and explained broaching problems, such as tooth design for different materials, chip, size, form and behavior, chip breakers, shear angle and coolants.

Development of broaching was outlined from its crude origin to present day use. A color film of jobs being done at Michigan Broach was shown.

As his program proceeded, the speaker invited floor discussion of points mentioned.

Jacob Leaves for India

Pontiac, Mich.—Alexander Jacob, an active member of Pontiac chapter and a native of India, has returned to that country.

A graduate of the University of Travancore, India, Mr. Jacob earned his master's degree in mechanical engineering from the University of Michigan. His practical training at General Motors Corp. was directed by Eldon Hall, Pontiac chapter chairman.

In India Mr. Jacob will be employed by the government as a production or consultant engineer.

Cutting Fluid, Factor In Control of Work Area

Madison, Wis.—Ultimate consideration in designing and building a machine tool is the area where the cutting tool contacts the workpiece. Control of that area is dependent upon control of three variables: knowledge of work material characteristics; selection, design and setup of the proper cutting tool; and adequate use of correct cutting fluid when required.

H. E. Brenneke, cutting oil specialist with the Wadhams Div., Socony-Vacuum Oil Co., expanded on these fundamentals between the two extremes of ductile and brittle materials, with particular emphasis on influence and function of cutting fluids, at a dinner meeting of Madison chapter, December 7.

Slides and wooden models of typical cutting tools were utilized by Mr. Brenneke to illustrate his talk.

Prior to the meeting the group enjoyed a color film made during a recent European tour by G. M. Class, vice-president in charge of engineering, and R. H. Stebbins, foreign sales staff member of Gisholt Machine Co., and presented by Mr. Stebbins.

A surprise guest was W. B. McClellan, ASTE national secretary, who explained the present status of the new home of the organization at Detroit.

Six members of the tool engineering course recently established at the University of Wisconsin, and their instructors, were also guests. The chapter is working closely with the University in expanding tool engineering curricula.

Coming MEETINGS

ALL CHAPTERS—January. Election of Nominating Committee. Consideration of nominees for national directors. February. Election of chapter officers and delegates.

AKRON—January 10. Speaker: E. B. Rhodes, industrial sales rep., Bendix-Westinghouse Automotive Air Brake Co., Elyria, Ohio. Subject: "Use of Air in Jigs and Fixtures."

CEDAR RAPIDS—January 19, 6:30 p. m., dinner, Montrose Hotel. Speaker: Wallace Ris, Olympic swimming sprint champion. Meeting program followed by visit to new Link-Belt Speeder Corp. plant.

CENTRAL PENNSYLVANIA—January 20. Speaker: K. N. Macomber, Lapointe Machine Tool Co., Hudson, Mass. Subject: "Latest Developments in Surface Broaching." February 17. Speaker: Anthony Zamis, Illinois Tool Works. Subject: Design of Gear Teeth.

CHICAGO—January 11, 12:30 p. m., International Harvester Mfg. Research Div., 5225 S. Western Ave. Plant visitation. Speaker: M. C. Evans, manager of manufacturing research.

CLEVELAND—January 14, 6:30 p. m., dinner. Plant tour, Eaton Manufacturing Co. Axle Div., 739 East 140th St. February 11. Old Timers' Night, honoring J. R. Fitzsimmons.

DAYTON—January 10, 6:30 p. m., dinner, Suttmiller's Restaurant; 8 p. m., meeting. Speaker: Paul F. Rehner, Allegheny Ludlum Steel Corp. Subject: "Manufacture of Lamination Punches and Dies by Applying Tungsten Carbide." Color movies illustrating manufacture of tungsten carbide; slides describing engineering design of punches and dies.

DENVER—February 2, 6:30 p.m., Range View Room, Silver Wing Cafe. Speaker: James Lucas, district rep., Simonds Saw & Steel Co. Subject: "Metal Band Saw and Flat Ground Stock."

DETROIT—January 13. Speaker: Herman Goldberg, Snow Mfg. Co., Chicago. Subject: "Observations on High Speed Drilling and Tapping." February 10. Engineering Society of Detroit banquet hall. President's Night. Speaker: I. F. Holland, ASTE president and gen. supt., small tool and gage dept., Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford, Conn.

ELMIRA—February 7, Mark Twain Hotel, Gray St., 7 p. m. Speaker: L. R. Maxon, New Jersey Zinc Co. Subject: "Die Casting."

ERIE—February 1, 7:15 p.m., General Electric Community Center. Speaker: G. H. Stimson, sales mgr., and chief eng., Gage Div., Greenfield Tap & Die Corp. Subject: "Screw Threads and Tap Design."

MOHAWK VALLEY (Utica, N. Y.)—January 25 (tentative), Charter Night, 78th chapter, ASTE.

NEW HAVEN—January 13, 6:15 p. m., dinner at Fitzgeralds; 8:00 p. m., meeting, Dunham Laboratory, Yale University. Speaker: O. H. Somers, Standard Gage Co. Subject: "Tools for Dimensional Quality Control." February 10, 6:10 p. m., dinner at Fitzgeralds; 8:00 p. m., meeting, Dunham Laboratory, Yale University. Speakers: Messrs. Doyen and Kessler, Welding Equipment & Supply Co. Subject: "Tool and Die Welding."

NEW YORK, GREATER — February 7. Speaker: D. W. Dudley, Gear Engineering Div., General Electric Co. Subject: "Instrument and Aircraft Gearing," touching on the essentials in gear design.

NIAGARA DISTRICT—February 3, St. Catharines. Speaker: Lorne C. Elder, Wallace Barnes Co. Subject: "Selection and Handling of Spring Materials."

PITTSBURGH—February 4, 6:30 p. m., dinner, Fort Pitt Hotel. 8:00 p. m., meeting. Speaker: Harold L. Murch, chief optical engineer, Jones & Lamson Machine Co., Springfield, Vt. Subject: "Inspection by Optical Projection." March 10-12, William Penn Hotel, ASTE 17th Annual Meeting.

RACINE—January 10, 6:30 p. m., Racine Manufacturers Bldg. Speakers: Ray P. Kells, chief service engineer, and Stewart G. Fletcher, chief metallurgist, Latrobe Electric Steel Co. Subject: "Modern Developments in Heat Treating and Production of Tool and Die Steels." Feb. 7, 6:30 p.m., Manufacturers Assoc. Bldg. Speakers: J. W. Stead, Jr., Westinghouse Electric Corp., Milwaukee, Wis. Subject: "Induction Heating."

SPRINGFIELD, ILL.—February 1, 6:30 p. m., The Mill, 906 N. 15th St. Program sponsored by Chicago office, Simonds Saw and Steel Co. Film: "Hack Saws and How to Use Them."

TOLEDO—January 12, 7:00 p. m., Toledo Yacht Club. Joint meeting with ASM. Speaker: George A. Roberts, chief Metallurgist, Vanadium-Alloys Steel Co., Latrobe, Pa. Subject: "The Behavior, Characteristics, Treatment and Application of Carbon and High Speed Tool Steels."

TORONTO—February 2. Subject: "Press Brake Applications and Methods," sponsored by Upton Bradeen and James, Ltd.

TRI-CITIES—February 2. Speaker: I. E. Rivkin, sales manager, Molina Industrial Diamond Co., Inc. Subject: "Industrial Diamonds and Diamond Tools."

TWIN STATES:—January 12, Springfield Vt. Speakers: L. J. Sheehan, C. G. Leitch, Henry Webster. Subject: "Material Selection." February 9, Springfield, Vt. Speaker: F. H. Penney. Subject: "Electronic Equipment."

WINDSOR—February 14. Speaker: Dr. M. E. Merchant, Cincinnati Milling Machine Co. Topic: "Metal Cutting."

WORCESTER—February 1, Putnam & Thurston's Restaurant. Speaker: W. H. Spence, sales director, Brown & Sharpe Mfg. Co. Subject: "Automatic Screw Machines and Tooling Applications."

Demonstration Contrasts Old and New Machines

Worcester, Mass.—The great strides made in boring and grinding machinery during the past half-century were brought home to 125 Worcester chapter members in a tour of the Heald Machine Co., November 9.

In the company's demonstration room, the latest models of borers and grinders were shown in operation against a background of early prototypes produced by this firm.

After dinner in the plant cafeteria, R. M. Lippard, Heald sales executive and a past president of ASTE, welcomed the engineers on behalf of the company.

C. G. Menard

W. D. Schmidt

William D. Schmidt, chief grinding engineer, and Clifford G. Menard, chief Bore-Matic designer, were the technical speakers. They used slides and charts in describing tooling designed in some of the more complicated setups for boring and grinding.

V. H. Ericson, third vice-president of the Society, spoke briefly of the ASTE Building Fund Participation Certificates.

Ralph E. Rawlings, chapter chairman, presided; and Carl D. Schofield, first vice-chairman, introduced the speakers.

European Traveler Gives Report at Ladies Night

Springfield, Vt.—Twin States chapter held its first Ladies Night, December 3, at the Trade Winds Cafe, with 61 members and guests present.

Alan Stubbs, foreign sales manager of Bryant Chucking Grinder Co., reported informatively on his recent trip to Europe. He made observations on social, industrial and political conditions in Czechoslovakia, England, Holland, Belgium and Sweden.

Entertainment Chairman F. J. McArthur introduced William Donahue, "Lubrications Engineer" of Jones & Lamson Machine Co., who kept everyone in laughter with his hilarious stories interspersed with selections on his "Montgomery Ward Stradivarius" violin.

Door prizes were presented by Vice-Chairman Lee M. Davis to Mrs. Kenneth Aiken, wife of Past Chairman Aiken, and to Mrs. Robert Martel.

During the remainder of the evening the group enjoyed dancing.

Makes Microwaves Turn Somersault Through the Air

s Angeles, Calif.—A spectacular nonstration of microwave transmission lighted the November 11 meeting of Angeles chapter.

ing a lucite elbow and a flexible tube as magic wands, R. H. Vickerpublic information supervisor of the fic Telephone and Telegraph Co., ole ultra-high frequency waves perform eye-popping feats.

In two black boxes, about 4 x 6 x 6 in., facing each other across the room, were a microwave transmitter and a receiver. The transmitter was modulated with the music from a record. To show how microwaves follow laws governing transmission of light, Mr. Vickerstaff stepped in the path of the beam, stopping the music. When he interposed a piece of brass, the music ceased again, but dry plywood caused no interruption.

By setting the transmitter on its back and holding a lucite elbow to the aperture, he obtained reception from the receiver, placed at the end of the curved piece of plastic. With a flexible brass tube as guide, he made the waves follow a 360 deg. turn from transmitter to receiver.

A parabolic mirror was used to show how microwaves may be focused like light rays. But unlike light waves, Mr. Vickerstaff revealed, microwaves are polarized—vibrate only in one plane—and the axis of vibration may be rotated through a 45 deg. arc by means of a "wave wrench," a honeycomb of metal strips.

Technical speaker was Vincent O. Stromberg, president, The Stromberg Co., Long Beach, Calif. In discussing "Torque Characteristics of Taps as Influenced by Design," he emphasized that speed of tapping has no noticeable effect on torque developed.

A lesser number of flutes reduce torque and yield a tap of greater strength, due to the greater cross-sectional area of the web. Gun-pointed taps develop a noticeably greater torque than plug taps, and taps with long tapered points are as troublesome as blunt ones.

R. Gerald Stronks, chief draftsman of Snyder Engineering Corp., was elected first vice-chairman to serve out the unexpired term of Harvey G. Groehn, who is entering business in Detroit.

Induction Heating Method Demonstrated in Slides

Wichita, Kans.—Eighty-two members and friends of Wichita chapter heard induction heating discussed at a dinner meeting November 9 in Droll's English Grill.

H. B. Osborn, Jr., ASTE national public relations chairman and technical director of Tocco Induction Heating Div., Ohio Crankshaft Co., was the technical speaker. By lecture and slides Mr. Osborn gave an interesting and comprehensive presentation of equipment, methods, application and advantages of induction heating processes.

"Is the United States Imperialistic?" or "An Open Letter to Mr. Vishinsky" was the duo-title of an address by Harry Cobden, owner of Cobden Shoe Shop. The Russian-born business man made illuminating comparisons of opportunities and ideals of citizens under capitalistic and communistic governments.

Guests and new members were introduced by Vice-Chairman Hazen Dool.

Welding Engineers Tell Economies of Arc Method

Philadelphia, Pa.—Virtually all types of tool steels can be welded by the metallic arc method with economy in time, material and equipment service, according to P. S. Doyen and F. E. Kessler, field engineers for Welding Equipment and Supply Co., Detroit.

Speakers at a recent meeting of 160 Philadelphia members, they classified

Samuel Boyer (center), Philadelphia chapter chairman, introduces F. E. Kessler (left) and P. S. Doyen of Welding Equipment Co. to chapter audience assembled to hear the two experts discuss advantages of arc welding

such welding of tools and dies into four phases: repairing dies, compositely fabricating dies, correcting designs, and rectifying errors. Each was detailed.

A. B. Luecke, membership chairman, reported current chapter membership as 634. Ten new members were added during the month, including two affiliate members: H. L. Yoh Co. and Link-Belt Co., both of Philadelphia. The group was urged to be especially active in securing affiliate memberships, basis of the chapter's scholarship awards.

Scholarship winner Charles Fees was introduced by P. A. Patterson, scholarship foundation chairman. Mr. Fees received his matriculation card, expressing appreciation. Runners-up for the award were present as guests of the Scholarship Committee. Educators attending the meeting were Dean Howard Gross of Spring Garden Institute, Kenneth Riddle, director of evening engineering school, Drexel Institute of Technology, and Dean Stanley Morehouse of Villanova College.

An appeal for members to suggest a standards program useful to industry was made by Harry Smithgall.

Thomas J. Donovan, Jr., national director, reported on the Los Angeles convention and urged all members to invest in ASTE Building Fund Participation Certificates.

Lower Speeds Economical For Machining Stainless

Kansas City, Mo.—"Tips on Application and Fabrication of Stainless Steel" were given to 50 Kansas City tool engineers by Ernst Von Hombach, research and development engineer with Carpenter Steel Co., Reading, Pa., at a chapter meeting held December 1 at the Advertising and Sales Executives Club.

Machining of stainless steel, Mr. Von Hombach stated, has been found more economical at slower production rates because of the decided increase in parts turned out between tool grinds.

Generally, surface feet per minute ranges from 80 to 140 in free-machining grades of stainless steel. Proper grinding and finishing of tool are important. A stoned edge produces the best finishes and extends tool life.

Hardness of steel also affects tool life, Rockwell 30C hardness being used considerably. At Rockwell 32C hardness tool life begins to taper off.

In turning free-machining stainless steel, the speaker continued, the tool does not require chip curlers or breakers. He emphasized importance of chip clearance for good finish and tool life. Front clearance angle must not be ground with periphery of grinding wheel because it weakens the cutting edge by removing stock immediately beneath it.

Among other considerations named for drilling, tapping, broaching, reaming and milling the 37 types of stainless steel are: drill point should have 140 deg. included angle for best results; spiral fluted taps are most universally used for tapping; grinding of the chamfer on tap must be uniform on all flutes.

Internal broaching can be used providing broaches are designed properly and made by a reliable manufacturer. Ample stock is required for good reaming; 30 to 35 deg. chamfer is best for reamer. A seven deg. helix angle is used most successfully. On milling cutters a narrow land, .015 to .030 in. is required.

200 See Fabrication Of Tubing, Auto Parts

Rochester, N. Y.—Rochester Products, the fuel division of General Motors Corp., played host to some 200 local ASTE members, November 16.

John C. Dense, assistant plant manager and a former chairman of the Rochester ASTE chapter, welcomed the party. Staff members conducted the engineers through the plant in small groups.

First the visitors watched ribbons of flat steel being transformed into strong, brazed and welded tubing capable of withstanding pressures of from 5,000 to 8,000 lb psi. Then they saw the tubing fabricated into parts for automobiles, refrigerators, auto aerials and other units or partial units.

In addition, the group learned how automotive locks and keys are made, as well as carburetors, fuel pumps and aircraft pressure control units. They were especially impressed with diecasting operations, and engineering research activities conducted in the laboratory.

GOOD READING

A Guide to Significant Books and Pamphlets of Interest to Tool Engineers

HANDBOOK OF INDUSTRIAL ELECTRONIC CIRCUITS, by John **Markus** and **Vin Zeluff**, is a compilation of over 440 circuits of practical use to the engineer. These drawings and explanatory text have been selected from all pertinent magazines and reproduced here in groups arranged according to function. The majority are from the magazine *Electronics*.

Included in the book are audio-frequency circuits, capacitrance control, cathode-ray, general control circuits, counting circuits, direct-current amplifiers, electronic switching, limiter circuits, measuring circuits, metal-locating, motor control, and multivibrator circuits; oscillator, photoelectric circuits; power supply, stroboscopic and telemetering circuits. Temperature control systems, timing circuits, ultrasonic, voltage regulator and welding control circuits are included.

The book, comprising 272 pages, is available from the *McGraw-Hill Book Co., Inc.*, New York, at $6.50 per copy.

TURNING AND BORING PRACTICE, by **Fred A. Colvin** and **Frank A. Stanley**, is the third edition of this book by the team. Material appearing in the wartime supplement to this book is included, as well as data on mandrel and taper work on lathes; on precision boring; and material on carbide tools for various types of work.

This guide to turning and boring practice presents the essential principles and major problems involved in the different operations; describes the more important varieties of machines and methods of operating them; includes data on feeds and speeds, new cutting alloys and materials, use of coolants—to name a few.

Types of lathes, their descriptions and operating principles are followed by typical lathe operations—turning tapers, thread cutting, fundamentals of accuracy. The turret and semi-automatic lathes are described, followed by the automatic screw machine and its operation. Section Four covers boring machines, and cutting tools for different materials are discussed in Section Five.

"Turning and Boring Practice," 531 pages, may be obtained from the *McGraw-Hill Book Co., Inc.*, New York City, at $4.75 per copy.

MACHINE DESIGN DRAWING ROOM PROBLEMS, by **C. D. Albert**, professor of machine design emeritus, Cornell University.

The author has incorporated several changes in this fourth edition, including a number of revised chapters. The changes also include new illustrative material in some instances.

This book presupposes a knowledge of kinematics, mechanics and engineering drawing, and covers material for a drawing room course in machine design. Practical problems in design are included in the text on parts and systems such as flanged shaft couplings, the Hydra-matic automotive transmission, an air-operated arbor press, and on pump problems. Engineering materials are described, and a brief review is offered of major engineering processes as forging, casting and machining.

Other chapter headings include straight and helical gears; worm gearing; tolerances and allowances for metal fits; bearings; and screw threads and screw fastenings.

The book, 519 pages, may be obtained from *John Wiley & Sons, Inc.*, 440 Fourth Ave., New York 16, at $5.00 per copy.

SMALL BUSINESS: ITS PLACE AND PROBLEMS, by **A. D. H. Kaplan**, is a research study of the Committee for Economic Development.

The book is a thorough study of small business, taking into consideration first the place of small business in the American economy, and the question of the cost of small business to the economy in terms of loss or gain to related segments such as creditors, individuals, consumers. The place of small business as a stabilizing element in manufacturing, distribution and service is discussed, as well as the need for new small businesses.

The definition of small business—what constitutes a small business in terms of size, sales, etc., is well covered. The author makes a successful attempt to correlate definitions given by Congressional committees, the Department of Commerce, Bureau of Labor Statistics and others. Having set the boundaries for his subject, the author studies the prewar and postwar patterns of small business, and a series of tied-in factors such as business mortalities, financial considerations, efficiency and management. "Meeting Financial Requirements" comes into this part of the study, and the need, size, type and availability of credit for the small business are outlined for new venture capital, and working capital, from the standpoint of bank loans and securities flotation possibilities.

"Small Business: Its Place and Problems," 281 pages, is available from the *McGraw-Hill Book Co., Inc.*, New York, at $3.25 per copy.

Shown above is the interior of the "traveling laboratory"—a specially-designed trailer built by Shakeproof, Inc., for mobile demonstration of fastener engineering before plant personnel and various educational and industrial groups. Exhibits featuring actual fastener applications line both sides of the trailer, in addition to testing equipment used in the demonstrations. Sound motion picture projection equipment enables a detailed presentation of fastener applications to be shown before limited groups.

THE TOOL ENGINEER'S *Service Bureau*

FREE BOOKLETS AND CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

Air Tools, Portable

A 44-page catalog features redesigned line of portable air tools. Illustrated, has loose-leaf binding. Data on air pressures and air tool efficiency are included. *Buckeye Tools Corp.*, Dayton 1, Ohio.

Bearings, Roller

Four-page bulletin illustrates self-aligning roller bearing units, including design housings, "Z" type seal, and micrometer steps in adjustment using screwdriver. *Shafer Bearing Corp.*, 801 Burlington Ave., Downers Grove, Ill.

Bearings, Tapered, Rolling

"The Story of Better Tapered Roller Bearings," 12 pages, illustrates the advantages of roller tapered bearings, and describes the Tyson cage design. *Tyson Bearing Corp.*, Massillon, Ohio.

Broaching Machines

Three four-page technical bulletins available: RD-48 describes pull-down, RU-48 describes pull-up, and RS-48 illustrates single-ram type broaching machines. Dimensional drawings, specifications and applications are included in each. *Colonial Broach Co.*, Box 37, Harper Station, Detroit 13, Mich.

Carbide Tools

Bulletin FE-127, 28 pages, describes sintered tungsten carbide tips and tools, boring bits, Mechanigript adjustable tool holders; and special tips, nibs and wear parts made to customer's orders. *Firth-Sterling Steel & Carbide Corp.*, McKeesport, Penna.

Chaser Die Heads

Bulletin 15, four pages, covers insert chaser die heads for Davenport automatic screw machines. Two sizes are described, in addition to single opening and closing yoke used for both heads. *The Eastern Machine Screw Corp.*, New Haven 6, Conn.

Clutches

Bulletin 948, four pages, describes a recently-developed spring clutch. Longer life claimed due to improved design. Operational data included. *L. G. S. Spring Clutch Corp.*, Indianapolis 6.

Coatings, Protective

"Koppers Industrial Protective Coatings", 12-page bulletin, gives information on surface protection, coating thickness and application. *Tar Products Division, Koppers Co., Inc.*, Pittsburgh 19.

Diamond Tools

"Industrial Diamond and Diamond Tools", 10 pages, describes dressing and cutting tools, wheels, cutting saws. Helpful hints included. *Anton Smit & Co., Inc.*, 333 W. 52nd St., New York 19.

Drills

General catalog, 225 pages, features handy loose-leaf binding, convenient classifications. Practical data on drills and reamers included. *The Chicago-Latrobe Twist Drill Works*, 411 West Ontario St., Chicago 10.

Dust Collector

Two-page folder, Bulletin A-550, describes a large capacity dust collecting system for handling rubber and wood chips, lint and similar material. *Aget-Detroit Co.*, Ann Arbor, Mich.

Fans, Propeller

Catalog No. 148, 24 pages, covers self-cooled propeller fans for all degrees of exhaust fan requirements. *Ilg Electric Ventilating Co.*, 2850 N. Crawford Ave., Chicago 41.

Forgings, Drop

Drop forged industrial hardware and forged specialties are described in latest 20-page catalog, including standard items and facilities for contract work. *Merrill Brothers*, Arnold Ave., Maspeth, N. Y.

Furnace, Liquid Electrode

Four-page bulletin describes principle of operation of liquid electrode salt bath furnace. Power is conducted through pools of metal molten at operating temperatures. *The A. F. Holden Co.*, New Haven 8, Conn.

Gear Checker

Bulletin C45-11-A, fifteen pages, discusses checking gear dimensions with the Red Ring universal gear checker, pointing out simplicity and accuracy of operation. *National Broach and Machine Co.*, 5600 St. Jean, Detroit 13.

Grinding Machines

Bulletin 112 describes grinding, polishing and buffing machines; lists specifications and attachments. Four pages. *The Standard Electric Tool Co.*, Cincinnati 4.

Potentiometers

Catalog No. 15-13, 32 pages, describes Brown recording instruments, including strip and circular chart recorders, indicators and controllers. *The Brown Instrument Co.*, Wayne & Roberts Ave., Philadelphia 44.

Pumps

Catalog J, 20 pages, covers pumps, pump controls for high and low power installations. Pipe testing machines, general engineering data included. *American Engineering Co.*, Philadelphia 25.

Riveting Machines

The Rapid Riveter is described in Hanna's Bulletin 246, 15 pages. Specifications and photos of models shown. *Hanna Engineering Works*, 1765 N. Elston Ave., Chicago 22.

Steel Bars, Cold Finished

Eight page bulletin on cold finished steel bars describes finishing processes; has guide to selection, AISI steel compositions, table of mechanical properties and listing of steels in stock. *Joseph T. Ryerson & Son, Inc.*, Box 8000-A, Chicago 80.

Tapping and Threading Attachments

Six-page bulletin describes threading and tapping attachments for drill presses, including seven sizes made for No. 0 to ¾ in. taps and No. 6 to ⅜ in. dies. *Ettco Tool Co.*, 594 Johnson Ave., Brooklyn 6, N. Y.

Thread-Generating Machine

Four-page folder on the Cornelius thread-generating machine for cutting screw threads, lead screws and worms, employing a different operating principle. *George Scherr Co.*, 200 Lafayette St., New York 12.

Toolmaking

"The Starrett Story" is a 32-page booklet describing the origin and development of the *L. S. Starrett Co.* Well illustrated. The L. S. Starrett Co., Athol, Mass.

Vibration Control

Control of vibration is explained in four-page folder, with selector chart giving over fifty applications and recommendations. *The Korfund Co., Inc.*, 48-40-J Thirty-second Place, Long Island City 1, N. Y.

Welder, Stud

Operating manual, 28 pages, covers applications of automatic electric-arc stud welders. Procedures, physical properties of studs, template use and design, and maintenance are included. *Nelson Stud Welding Div., Morton Gregory Corp.*, Toledo Ave. & East 28th St., Lorain, Ohio.

North East West South IN INDUSTRY

Russell Inwood has been named vice president in charge of manufacturing and engineering of **The Rapid-Standards Co.**, Grand Rapids, Mich., it was announced by James R. Sebastian, president.

Stewart-Warner Corp. announces the purchase of physical assets, patents and trade marks of **Heating Research Corp.**, Anderson, Ind., according to an announcement by James S. Knowlson, Stewart-Warner president and board chairman.

E. W. Miller, vice president and general manager of **The Fellows Gear Shaper Co.**, was entertained at a dinner given recently in observance of his fifty years of service with the company.

E. W. Miller, left, is shown receiving a commemoratory book from E. J. Fullam, retiring president of Fellows Gear Shaper, at a dinner given for Mr. Miller in observance of his fifty years with the company.

At a meeting of the board of directors held last month, **E. J. Fullam** was elected chairman of the board, and will be replaced as president by **E. W. Miller. R. M. Fellows** was elected first vice president and treasurer, **C. M. Peter** vice president and general manager, and **H. T. Gates,** vice president and factory manager.

John S. Cort, Jr., has been appointed assistant to the president of **Martin Dennis Co.**, of Newark and Kearny, N. J., it was announced by A. L. Geisinger, president. Mr. Cort succeeds **Charles E. Grant,** who was recently promoted to manager of chromium chemical sales for **Diamond Alkali Co., Cleveland,** of which Martin Dennis is a subsidiary.

Celebrating its fifty-fifth year is the **Manhattan Rubber** division of **Raybestos-Manhattan, Inc.** The organization traces its ancestry back to the Roxbury Rubber Co., said to be the first chartered rubber company in the United States.

General Electric Company recently opened a new $3,000,000 plant at San Jose, Calif., which at peak production will be able to turn out more than 1,500 electric motors weekly.

Frank B. Rackley has been named vice president in charge of sales of **Jessop Steel Co.**, Washington, Pa. **Curtis A. Gordon,** general works manager, was appointed vice president in charge of operations.

Edward C. Meagher, treasurer of Texas Gulf Sulphur Co., was elected president of the **United Engineering Trustees, Inc.,** at its annual meeting. Other officers elected were vice president, **James F. Fairman,** vice president of Consolidated Edison Co.; vice president, **Irving W. Huie**, president of the Board of Water Supply, New York; treasurer, **Kurt W. Jappe**, treasurer of ASME; assistant treasurer, **James L. Head,** Chile Exploration Co., New York. **John H. R. Arms** was re-elected secretary.

William F. Ritchie has been appointed sales manager of the **Rylander Manufacturing Corp.**, according to an announcement by John V. Rylander, president.

Mr. Ritchie's more than 20 years' experience in the stamping industry includes a broad background of automotive and industrial engineering and sales.

James D. Allen

John A. Proven

James D. Allen has been appointed manager of domestic machine tool sales of **Pratt and Whitney** division, it is announced by William P. Kirk, vice president, sales. Mr. Allen, formerly manager of the Cleveland office, will be replaced by **Frank W. Schreiner,** who has been associated with the Cleveland office for more than 20 years.

John A. Proven has been named general sales manager of **Porter-Cable Machine Co.**, Syracuse, Mr. Proven was formerly vice president and sales manager of Sterling Products Tool Co., Chicago.

B. A. Woina has been appointed director of the sheet metal products development and production engineering divisions of **Designers for Industry, Inc.** Mr. Woina was formerly chief engineer of Mullins Manufacturing Company.

F. A. Smith Manufacturing Co., Inc., announces that, effective immediately, the firm will be known as **Fasco Industries, Inc.** There is no change in personnel or policies.

Richard W. Schreck has been named Michigan divisional sales representative of the **Watson-Stillman Co.**, it was announced by A. G. York, vice president in charge of sales. Mr. Schreck was formerly with The Hydraulic Press Mfg. Co.

J. T. Gillespie, Jr.

Stanford P. Bruce

J. T. Gillespie, Jr., formerly director of export sales, was recently named general sales manager of Watson-Stillman Co., it was announced by A. G. York, vice president, sales.

Stanford P. Bruce, inventor of the "Diamond-Miser", has joined **Wheel Trueing Tool Co.**, according to an announcement by Harvey B. Wallace, president. Mr. Bruce is in charge of the company's newly-formed "Diamond-Miser" division.

E. L. Sandberg has been appointed assistant general manager, and **T. M. Redmond** plant manager of the **South Wind** division of **Stewart-Warner Corp.**, it was announced by **A. R. Collins**, general manager. They follow by a few days the announcement by J. S. Knowlson, president and board chairman, of the appointment of Mr. Collins as head of the Indianapolis division of the company.

Martin C. Butters, formerly connected with E. I. DuPont de Nemours & Co., has joined the staff of **O. K. Tool Co., Inc.,** manufacturers of inserted blade milling cutters and metal cutting tools.

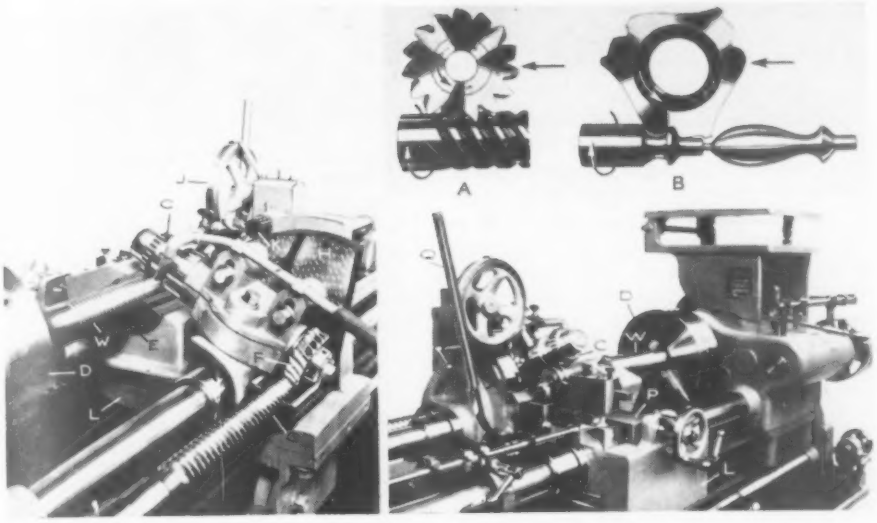
John C. Kuhn, formerly sales manager, has been appointed vice president and director of sales of **Morse Twist Drill Co.** At the same time, **A. L. Carr** has been advanced from assistant sales manager to sales manager.

COMING EVENTS

Jan. 20-22. CONFERENCE ON INDUSTRIAL MOBILIZATION, Society for the Advancement of Management, Chicago.

Feb. 13-17. GENERAL MEETING, American Institute of Mining and Metallurgical Engineers, San Francisco.

TOOLS OF TODAY



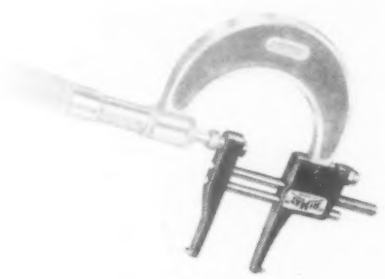
Thread Generating Machine

An automatic Threading Machine, particularly adapted for the production of machine tool lead screws, has been introduced by the George Scherr Company, 200 Lafayette St., New York 12, N.Y. The machine is based on the generating principle of the so-called hour glass or globoid worms. This type of worm contacts the worm gear over its full length instead of engaging only at the mid-section, as is the case with cylindrical worms.

As applied to this machine, the bar or worm blank to be threaded—W—is held on one end in a universal self centering chuck, D, or in a special holding fixture suiting the work. The work is supported in a segment bushing—as indicated by E, photo at left—directly below the cutter. The generating cutter, C, which has the helix angle of the work, is driven directly by a bronze worm wheel, F, meshing with the master lead screw, G.

This direct drive eliminates errors which might be introduced by change gears, backlash of couplings and other looseness—that is, the accuracy of the master lead screw is directly transferred to the screw being cut. Depth of cut is controlled by a handwheel, J, which is graduated in thousandths. Action of the machine, of which headstock and carriage details are shown, is fully automatic and, it is claimed, requires no special skill to operate. In addition to generating worms, as indicated by A, upper left photo, the machine can also be used to generate many different forms as suggested by the machine handle B. **T-1-1**

Conversion Adapter for Mikes



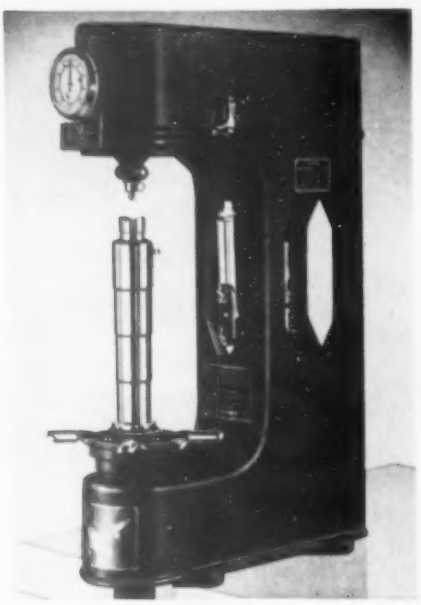
An attachment for outside micrometers which makes possible the measuring of internal dimensions—the Rimat Microdapter, by the Richards Machine Tool Company, Glendale, Cal.—is designed to meet a need of toolmakers and machinists for an inexpensive tool which is as accurate as the micrometer to which it is attached. With it internal measurements are facilitated and, as claimed, with the elimination of error often encountered when using telescopic gauges or conventional inside micrometers. **T-1-2**

Chip Breaker Grinding Fixture

A compact, precision grinding Fixture, by Royal Oak Tool and Machine Company, 62 E. 4th St., Royal Oak, Michigan, has been especially designed to grind chip breakers on tungsten carbide insert type bits. While designed for use with surface grinders, the fixture can also be used with cutter grinders for tool grinding operations aside from chip breaker grinding.

Calibrated scales provide for setting at desired angles, and interchangeable index plates provide true triangular, square or other polygonal forms. Special collets for round, square, triangular shapes are available in 1/4, 3/8 and 1/2 in. sizes. **T-1-4**

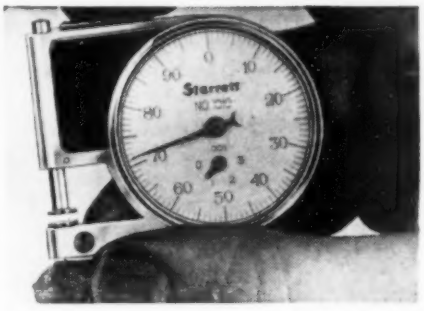
Improved Hardness Tester



An improved Hardness Tester, by Clark Instrument, Inc., 10200 Ford Rd., Dearborn, Mich., features light weight because of a cast aluminum body; frictionless spindle, assuring correct minor load; positive tripping for more accurate major load; and a fully protected elevating screw.

The tester, which is used for "Rockwell" testing of hard and soft steel as well as other ferrous and non-ferrous materials, is available in three standard models—8, 12 and 16 inch vertical capacity. **T-1-3**

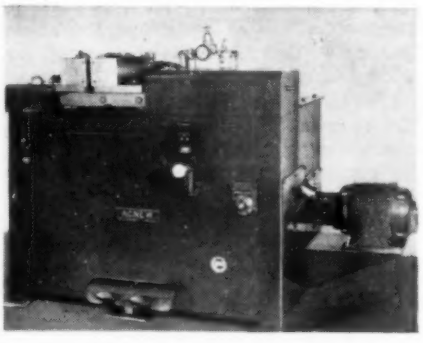
Vest-Pocket Dial Indicator



No bigger than a thin pocket watch, a Dial Indicator Gage by the L. S. Starrett Company, Athol, Mass., provides a handy means of measuring and comparing thicknesses of paper, leather, sheet metal, wire, plastics, and other materials. It is said to be especially useful to inspectors, salesmen, purchasing agents and stock clerks who make a variety of quick measurements.

Designed to fit into the curve of thumb and index finger, it has a large, easy-reading dial graduated in thousandths. A small "tell tale" hand counts revolutions of the larger hand up to the maximum range of ⅜ inch. The spindle is raised by sliding a serrated plate at the top edge of the gage. Decimal equivalents of fractions are shown on the back of the gage. **T-1-5**

Hydraulic Welder

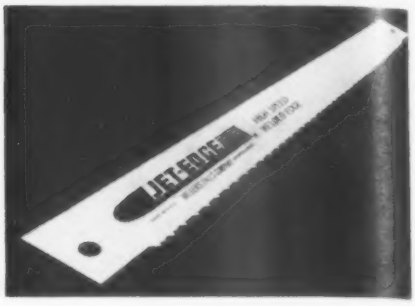


A hydraulically-operated Flash Welder, identified as Type HAB and announced by Agnew Electric Company, Milford, Mich., is completely automatic except for loading and unloading. A hydraulic pump supplies the pressure to actuate the movable platen; a flow valve controls the flash cycle; and air is used for clamping.

The dies are replaceable inserts which are said to not only minimize die costs but also to make practical a broad application of work. The tap switch on the transformer provides a wide heat range for diversified production.

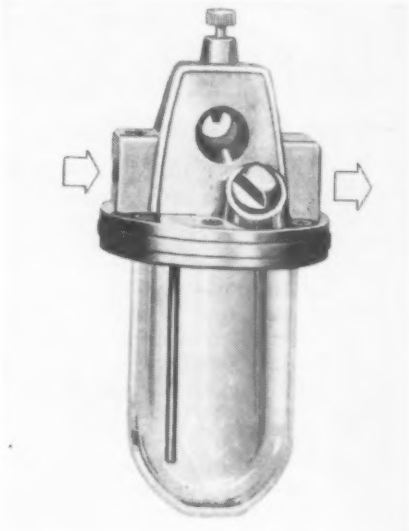
The machine is equipped with water-cooled 50 KVA transformer and clamps, welder type magnetic contactor and all necessary pressure controls. This welder was particularly designed not only for where a uniformity of welds is required, but also where close tolerances must be held. **T-1-6**

Welded Edge Hacksaw Blade



A super high-speed Hacksaw Blade, claimed to be shatter-proof and unbreakable, has been introduced by the Millers Falls Company, Greenfield, Mass. Named "Jet-Edge," the blade is said to materially reduce cutting costs under exceptionally tough testing conditions. **T-1-7**

Air Line Lubricator



An Automatic Lubricator for installation on lines serving compressed air operated tools and equipment, announced by Hannifin Corporation, 1101 So. Kilbourne Ave., Chicago 24, Ill., meters the oil into the air stream as a fine mist, beneficial in reducing friction and heat and also in prolonging the life of air powered equipment.

Sturdy and attractively styled, the lubricator consists essentially of a body, to which pipe connections are made, and a bowl—of transparent plastic construction—containing a supply of lubricating oil. Oil level, and the rate of flow of oil is visible from both sides and can be accurately controlled by a needle valve.

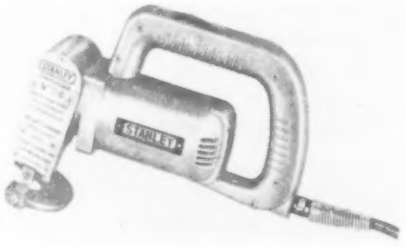
Removal of an oil filler plug in the body automatically shuts off the supply and releases air pressure in the bowl, making it possible to replenish oil without shutting off line pressure. Economy in oil consumption is attained because oil is injected only when air is flowing. Designated as the Hannifin Series "RL" Automatic Air Line Lubricator, units are now available in ⅜ in. and ½ in. sizes built of non-corrosive material for line pressures to 150 p.s.i. **T-1-**

Portable Electric Pyrometer

Electric-Arc, Inc., 152-162 Jelliff Avenue, Newark 8, N. J., announces a portable electric Pyrometer Recorder or/and controller, so arranged that six points of heat to 2200° F. can easily be recorded or controlled. It is said to be fast-acting and precise, and arranged for simple electrical off-on control.

It may be used for semi-automatic program control, for heat cycles or completely automatic heat cycle program control and, in the welding field, can be utilized with such equipment as Smith-Dolan Induction Heaters for pre-heating before and stress relieving after welding. It may also be utilized with other systems employing resistance heating. **T-1-9**

Unishear by Stanley



Stanley Electric Tools, New Britain, Conn., announces its No. 218 Unishear, a production tool weighing only 4¾ lbs., that is said to cut 18 gauge mild hot rolled steel—other materials in proportion—at a speed up to 15 ft. per minute.

Improved blade action "feeds in" the work so that little effort is required by an operator to cut straight lines, curves, angles and notches with hairline accuracy.

Full ball and roller bearing construction, automatic lubrication of plunger from gear housing, convenient slide operated switch, and minimum number of moving parts are design features of this tool. It is furnished with rubber covered three-wire cable, wrenches, clearance gauge and supply of lubricant. **T-1-10**

Pneumatic Riveter

A pneumatic Riveting Machine, by Hill Machine Company, 1032 Mulberry St., Rockford, Ill., incorporates a high-speed, air operated reciprocating hammer working against an adjustable anvil.

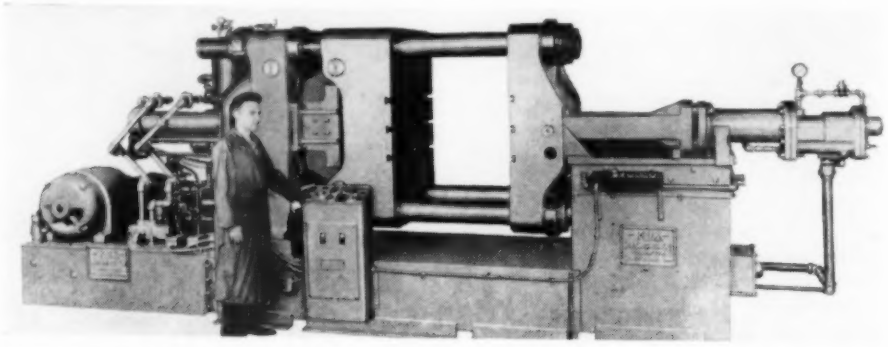
The unit is offered with a stationary or elevating anvil, both adjustable. An auxiliary air motor rotates the hammer spindle, and a toggle action on the elevating anvil type provides a solid anvil for the hammer.

Two types of work tables are available. One is a 6½ x 6¾ in. cast iron table, the other of 40 x 24 in. plywood. Both are readily removed or interchanged. **T-1-11**

Large Die Casting Machine

What is claimed to be the world's largest standard die casting machine has been introduced by the Kux Machine Co., 3940 W. Harrison St., Chicago, Ill.

Available in three different models, this machine, having 800 tons locking pressure, is said to form castings in zinc weighing up to 30 lbs. and in aluminum weighing up to 10 lbs. High injection pressures are utilized, reaching as much as 40,000 lbs. p.s.i.



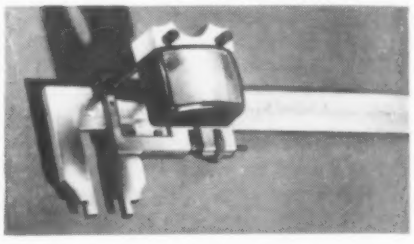
Having a die space of 40 in. x 25 in. between the tie bars and 17½ in. of die separation, very large dies can be accommodated and castings having a deep draw produced.

Completely hydraulically operated and electrically controlled, movement of electric push buttons is said to be all that is required for a complete die casting cycle. Speed of operation is practically the same as on smaller machines, with an average of 3 to 4 zinc casting cycles, or 2 aluminum casting cycles per minute being possible.

As a gooseneck plunger type machine, Model BH-40 will produce zinc, lead or tin die castings, and has its self-contained melting pot and furnace incorporated within the frame of the machine.

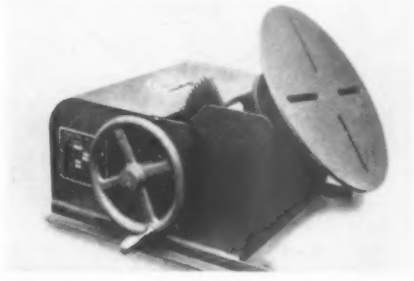
T-1-12

Magna Eye for Verniers



The "Magna Eye", by Stebar Company, 711 W. Lake St., Minneapolis 8, Minn., is designed to magnify vernier scales and provides easy reading. The Magna Eye is made in three sizes to fit the most widely used Brown and Sharpe and Starrett calpiers and height gages. No. 100, for 6 in. Vernier calipers; No. 200, for 10 in. height gages, and also interchangeable for the 10 in. caliper; and the No. 300, for 18 in. and 24 in. height gages. T-1-13

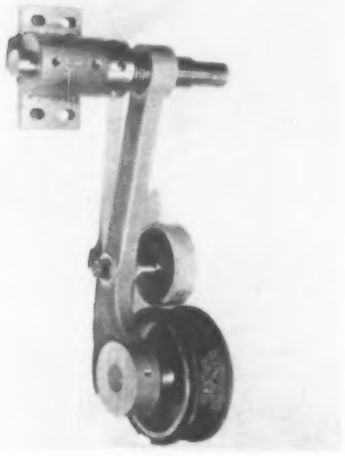
Motor-Operated Positioner



A small motor-operated Positioner—Model I-P, by Ransome Machinery Company, Dunellen, N. J.—has a load capacity of 100 lbs. and, because all welds can be made in the down-hand position, welding is facilitated and production materially increased.

The unit is driven by a hydraulic variable speed transmission and a ½ HP single phase AC motor. The table top rotates 360° at variable speeds adjustable from 0 to 5 RPM in either direction. It is manually tilted through 135° and locks at any degree. T-1-14

Conveyor Line Marker

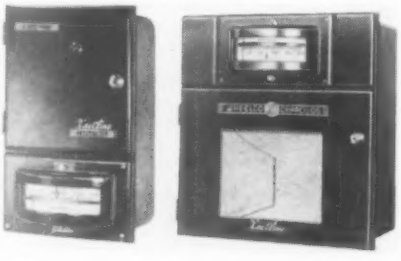


Wm. A. Force & Company, 216 Nichols Avenue, Brooklyn, N. Y., announces a marker which can be adapted to most existing conveyor lines and which is said to do an efficient job of dating, coding, or marking for production control. The standard wheel is 5 in. in diameter with an overall width of 2 in. which provides a printing capacity of 1 in. width. The unit, made of aluminum castings to reduce weight, can be used either in horizontal or vertical position.

The printing wheel has two rubber friction bands under adjustable spring tension for proper driving friction. The inking roll is of felt, with an adjustment to compensate for wear and to enable operator to control the amount of ink as required.

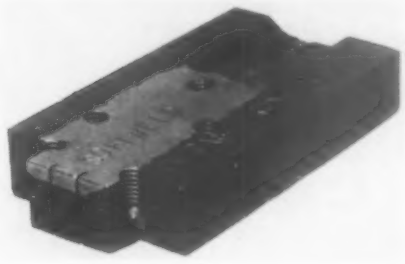
The printing wheel is furnished either as a continuous marking roll, or with a spring return so that it returns to a specific printing position after each impression. This insures the marking to appear on the same location on each box or carton. **T-1-15**

Temperature Control Instruments



Two types of instruments for indicating and recording temperature control—the Xactline-Capacitrol and Xactline-Capacilog—shown left and right, respectively—are announced by the Claud S. Gordon Company, 3000 S. Wallace St., Chicago 16, Ill. Each combines the conventional pyrometer control features with the auxiliary devices for maintaining precision "straight line" temperature control, and either is said to be readily applied to any electrically heated or fuel-fired oven or furnace equipped with motor-operated valve or solenoid valve. **T-1-16**

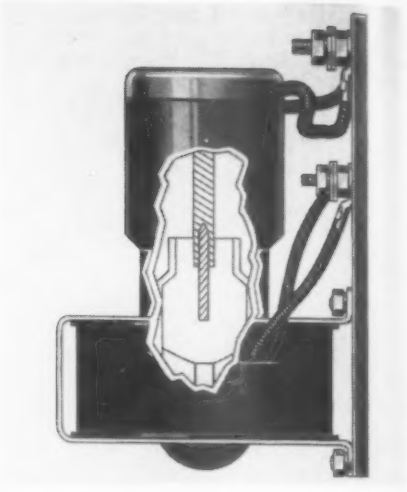
Electrode for Soft Welds



The Lincoln Electric Company, Cleveland 1, Ohio, announces an improved non-ferrous electrode—called Softweld—for depositing soft, readily machineable welds in gray iron castings. This electrode, which supersedes previous electrodes manufactured by Lincoln under the same name, is designed for AC or DC operation.

The electrode operates with a soft, steady arc and causes the weld to flow over and bond to the cast iron with minimum penetration and heating of the base metal. **T-1-17**

See page 82 for handy Tools of Today coupon.



Mercury-Type Relays

A line of improved "hydrogen arc-quenched" mercury-life Relays, by Durakool, Inc., Elkhart, Ind., operates on the double flow principle. Contacts are between two pools of mercury in the presence of hydrogen gas under high pressure. Thus, arcing is kept at a minimum and, according to maker claims, heat and corrosion are practically eliminated.

The relays feature four types of action, available with normally open or normally closed contacts: Quick operate—quick release; slow operate—slow release; and slow operate—quick release. Time delays are available, to specifications from 0.15 to 20 seconds, and the relays are made in single or multiple units, the former furnished in 30 or 60 amps. **T-1-18**

Valves with Optional Features

Hand Valves, by Numatics of Milford, Mich., are now offered with optional features to meet a wide range of specific applications.

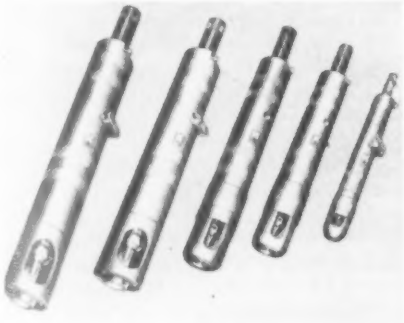
In addition to the regular horizontal lever, these include: (1) upright lever, for steel mill use, manipulators, crane control or any place where an upright lever conforms to other controls; (2) double chain lever, for hoist control, door actions, or installations requiring overhead mounting; (3) V-cam, or dog trip lever, for automatic reversing or reciprocating actuating. **T-1-19**

Fluxmeter Calibrating Unit

A Fluxmeter Calibrating Unit, for calibrating both the G-E indicating fluxmeter and the fluxmeter-type photoelectric recorder, announced by General Electric's Meter and Instrument Divisions, consists of an Alnico magnet rod and a housing with a built-in search coil which is tapped and connected through a selector switch and terminal post. The magnet—shown broken—is approximately 10 in. long and $\frac{3}{8}$ in. in diameter, with one end painted black.

To use, the unit is set upright with the unpainted end of the magnet placed in the opening atop the housing. The unit then is connected in series with the search coil to be used in making the flux measurement, and the switch is set at the desired value of flux-linkages. When the magnet is removed from the housing, the desired flux-linkage takes place. This makes it possible to calibrate the fluxmeter or recorder so that each millimeter of scale reading will be equivalent to a known value of flux-linkages. **T-1-20**

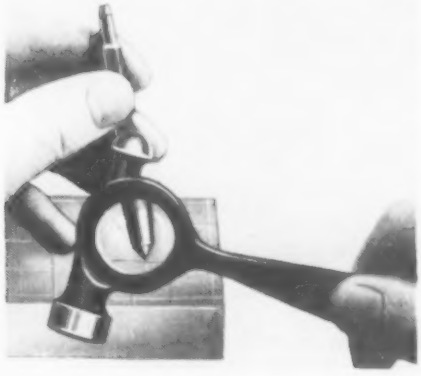
Multiple Drilling Tools



A line of 5 Airfeedril Units, by Keller Tool Company, Grand Haven, Mich., results in 34 speed combinations of stationary and portable units for drilling holes up to $\frac{3}{4}$ in. diameter in mild steel. The tools are light, ranging from $3\frac{1}{2}$ to 28 pounds from smallest to largest.

These tools are a combination of a Keller air drill, an air cylinder, and a hydraulic dashpot and feed control assembled in one housing and arranged for quick locking progressively in a jig or permanently into a fixture. **T-1-22**

Die Maker's Hammer



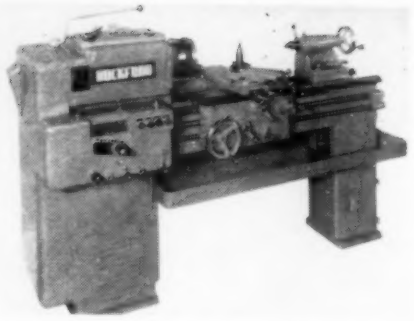
Accurate spotting and punching of center lines and intersections is simplified by a Tool and Die Makers' Hammer, introduced by The L. S. Starrett Company, Athol, Mass. A 7-power lens, built into the head of the hammer, eliminates the usual fumbling or looking away involved when separate glass and hammer are used. A punch can be precisely spotted and accurately struck without removing the eyes from the work.

Weighing only 4 ounces, the hammer is made from a steel forging with flat and ball peen heads. The heads are offset to permit use in corners or close to obstructions. **T-1-23**

14 In. Rockford Lathe

A medium size, general purpose Lathe of improved design, introduced to the machine tool industry by the Rockford Machine Tool Co., of Rockford, Ill., is designed to meet demand for a high-quality engine lathe in the medium priced field.

Key to the new Rockford Economy Lathe, as it is named, is an all-geared headstock with a range of twelve spindle speeds, all quickly adjustable by means of conveniently located levers. The spindle, made from a high-alloy steel forging mountel on Timken Zero-precision bearings, has a No. 1 tapered key drive. Headstock gears are cut from

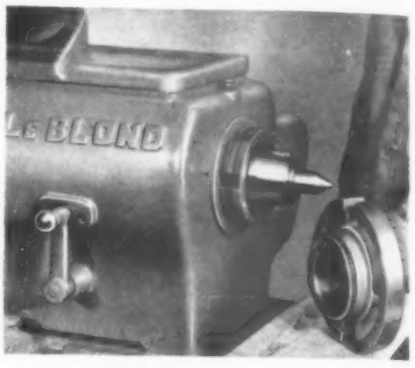


pre-heat treated steel gear blanks, annealed, hobbed and shaved to obtain precision and smooth operation. Gear lubrication is by immersion and oil-splash. Overall design of the headstock permits all types of lathe operations, including high spindle speeds and the use of tungsten carbide cutting tools.

All construction details throughout are on a similar level of precision design. Pick-off change gears, reverse gears, V-belts and similar parts and assemblies are easily accessible for adjustment or repair through the hinged door on the headstock end of the lathe. All moving parts, with the necessary exception of the spindle nose, are well protected to provide full safety for the machine operator. A bulletin, sent upon request, gives full specifications.

T-1-24

Lathes With Taper Key Drive

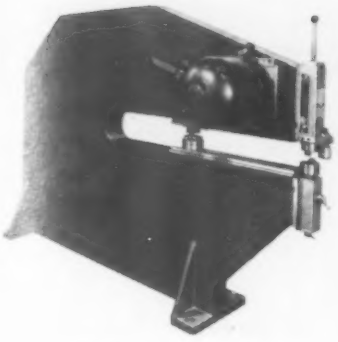


As announced by the R. L. LeBlond Machine Tool Co., Cincinnati 8, Ohio, the standard Taper Key Drive, in which LeBlond was a pioneer, is now being furnished in place of the threaded type on all LeBlond Regal lathes. The change-over has been effected without sacrifice of center distance capacity or any other advantage associated with the Regal lathes.

LeBlond lathes will now have the benefit of all the advantages claimed for this type of spindle nose, including easier and faster mounting of chucks and face plates. Operator merely needs to line up keyway and key and shove "home." The loose fit of the thread in the coupling collar and on chucks or face plates permits quick attachment and holds securely without binding.

Safety is provided by lock-tight mountings. Chucks and face plates positively cannot fly off spindle even at high speed. Danger of injury to operator's hands is also completely eliminated. Also, there is provided greater accuracy, better wear and longer life. Bearing surface is not subject to wear, and accuracy is therefore retained indefinitely. Another factor is low accessory inventory since special chucks and face plates are no longer required, especially for the Regals. T-1-25

Turn to Page 82
for Handy
Tools of Today
Coupon



All-Purpose Shear

An all-purpose, low-cost cutting machine for general shop use—the Tru-Edge Shear, by Elge Associates, 16 E. 71st St., New York 21, N.Y.—is said to produce a continuous cut with a finished and burr-free edge on both ferrous and non-ferrous sheet stock.

Material is not punched, but is sheared by what is said to be a new principle which eliminates resistance to feeding and turning. The lower tool remains stationary while the upper tool—which is spring loaded—reciprocates vertically. The company claims cutting speeds of 10 to 40 ft. per minute, depending on the material. **T-1-26**

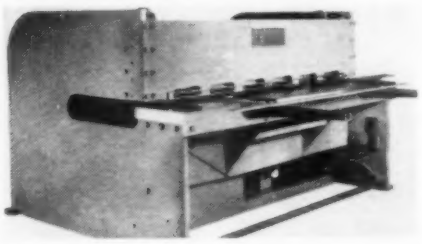
Adjustable Drill Head

A series of heavy-duty multiple, adjustable Drill Heads, announced by Strutz & Mead, Inc., Milwaukee 2, Wis., supplements the Kwick-Change line which already includes extra-light-duty drill heads, light-duty drill heads, and medium-duty drill heads.

The heavy duty series, manufactured by Wisconsin Drill Head Company, is made in 2-spindle to 8-spindle models. Bolt circles vary from $2\frac{3}{16}$ in. to $14\frac{63}{64}$ in. in the 2-spindle head to $7\frac{31}{64}$ in. to $20\frac{17}{64}$ in. in the 8-spindle head, both of which are designed to drill holes up to $1\frac{1}{4}$ in. in diameter in cast iron. They are equipped with No. 3 Morse taper spindles having a 1 in. vertical drill adjustment and incorporating anti-friction bearing construction throughout, and all gears are of S.A.E. 4615 carburized and hardened.

Design embodies the same principles as the lighter models. One set of positioning templates, all jig bored, is furnished with the head. **T-1-27**

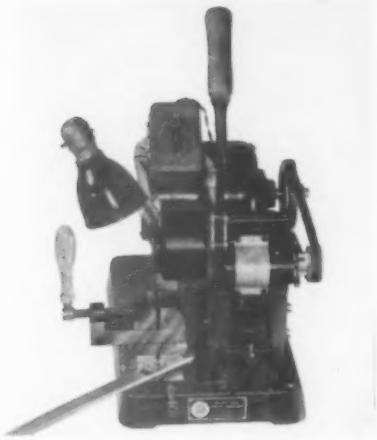
Squaring and Gap Shears



A line of all-steel Squaring and Gap Shears, by National Machinery & Equipment Co., 2129-A Penna. Ave. NW, Washington 7, D. C., employs hydroelectric drive for shearing and operations of automatic holddowns. The latter are designed to compensate for different thicknesses of sheet; thus, the heavier the stock to be sheared, the greater the holddown pressure exerted.

The shear is precision built throughout, with knives of high-carbon chrome alloy for heavy cutting. Knives have four cutting edges and may be turned to provide four sharp cutting edges before resharpening is necessary. A hydraulic relief valve provides protection against overload.

The shear may be operated with a foot treadle extending full length across, or with an extension foot pedal that may be remotely placed within the limits of an extension cord. A switch may be provided for continuous operation. T-1-28



Attachments for Rouse Hand Miller

Several attachments, recently developed for the high-speed Rouse Hand Miller, manufactured by H. B. Rouse & Co., 2214 N. Wayne Ave., Chicago 14, Ill., includes the No. 7 Vise, designed to considerably increase the range and productive ability of the machine. It is fitted with a specially slotted removable jaw enabling it to hold odd shaped pieces and can also be converted into an economical jig for use on other equipment.

To reduce personnel injuries, Rouse has also designed the No. 9 cast iron Safety Cutter Guard. The guard may be drilled for a coolant fitting which will convey the coolant directly to the cutting tool, and the operator may locate and adjust the guard left or right to suit efficiency and convenience.

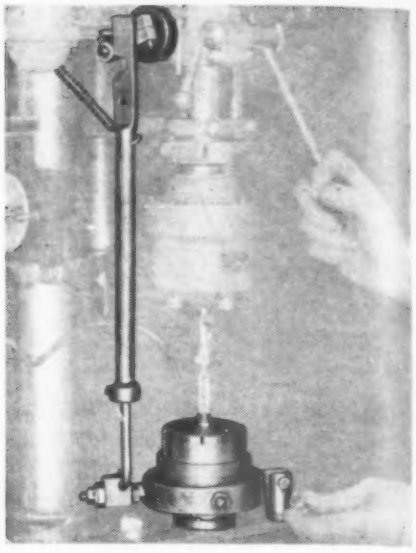
T-1-29

Improved Grinding Fixture

An improved Grinding and Indexing Fixture, by All Tool Company, 111 Long Avenue, Hillside, N. J., incorporates the accurate positioning features of previous models but adds a special tailstock provided with a spring loaded adjustable center. The arm is easily removed when not needed. Maximum distance between centers is $2\frac{3}{4}$ in., maximum diameter $2\frac{1}{2}$ in.

The use of this fixture—Model B—is used to eliminate the installation of expensive equipment for grinding small cylindrical work such as plug gauges, caps, multi-splines, and similar work.

T-1-30



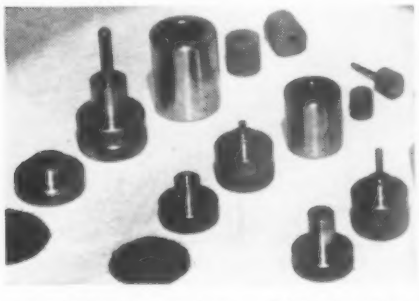
Quick Acting Collet Chuck

A simple mechanical linkage, developed by the Goodwin Mfg. Co., 10 East Broadway, Cuyahoga Falls 22, Ohio, adapts the standard Goodwin quick-acting collet chuck for attachment to any standard make of drill press to perform production drilling and tapping operations. The unit and all attaching members are furnished as standard equipment, and only two bolts and approximately fifteen minutes time are required to attach the chuck to a drill press.

Mechanical linkage connects the drill quill to the chuck collar so that the chuck is automatically closed and locked as the tool approaches the workpiece. Return of the drill press handle releases the workpiece instantly.

The chuck can be fitted with a spring ejector, available as an accessory attachment, to facilitate rapid removal of workpiece, or can be set up to allow the workpiece to drop through into a parts basket. The chucks, developed for use on drill presses, are available in sizes having 1 and 2-inch capacities. **T-1-31**

Carbide for "Wear-Proofing"



Carboloy cemented carbide, by Carboloy Company, Inc., Detroit 32, Mich., is used to "wear-proof" steel molds used for forming the smaller sizes of mounted wheels and points used on small high-speed grinders.

No change is effected in the all-steel molds beyond lining the barrels with the carbide. The lining resists the wear of the hard abrasive crystals and, it is claimed, increases life of the molds tenfold. **T-1-32**

Grease Testing Equipment

Equipment for testing ball-bearing grease under conditions similar to those of field use, and announced by the Special Products Division of General Electric Company, Schenectady, N.Y., accelerates those conditions which contribute to the destruction of grease and enables motor users and grease manufacturers to compare the performance of one grease with another.

The equipment consists of two components—the grease tester and a control box. The tester is a small motor-driven unit with two bearings, one for testing and the other as a guide. A 500-watt heater, located between these bearings, simulates the source and flow-paths of heat in an electric motor. The temperatures of the outer race of the bearings are measured by a pair of copper-copnic thermocouples.

The control box consists of two thermostats and a panel on which are mounted a motor switch, a line switch, an actuation button, and a time meter. The latter, marked in tenths of hours, measures time on a cyclometer-type counter up to a period of one year.

In operation, bearing loss increases and temperature rises as lubrication becomes less effective. When the test bearing overheats, the first thermostat is unable to control it and the second thermostat shuts off the heater and drive motor. The time meter then records the total hours of operation.

T-1-33

Transfer Type Machine For Intake Manifolds

A Transfer Type Machine, designed and built by Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit, completes in a work-cycle of 48 seconds 57 holes on faces of automotive intake manifolds. The machine has one loading station, eleven work stations and one unload station—thirteen stations in all. Parts are indexed from station to station by a hydraulically actuated shuttle.

The loading fixture, the 11 work fixtures and the unloading fixture are mounted on the machine bed which is made in five sections, cross-keyed and bolted together. Hydraulic piping and wiring is provided with junctions so that the machine can be moved in five sections and readily reconnected. Bed and columns are welded steel, ribbed for rigidity and thoroughly normalized.

The machine is equipped with Snyder standard units as follow: Six self-contained hydraulic units which carry multiple heads and bushing plates, two standard slide units and one standard tapping unit with multiple spindle head. In addition, three special slides are equipped with multiple heads. These units, slides and heads are mounted on risers and columns at various angles as required.

The part is moved into the loading station and manually positioned by the operator. Pressing the starter button automatically indexes the part into the first work station where locators register on locating spots cast on the part at the foundry.

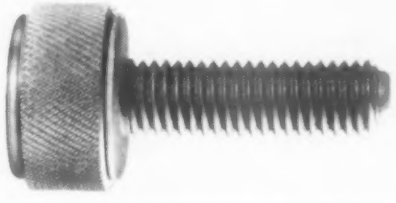
Starting with loading, the actual work-cycle is as follows: Sta. 1, load. Sta. 2, combine drill and ream (2) ½ in. diameter mounting holes; drill (1) ½ in. diameter mounting hole. Sta. 3, spot fact (3) mounting holes 1⅛ in. diameter. Sta. 4, drill (3) ½ in. diameter mounting holes. Sta. 5, spot-face (3) mounting holes 1⅛ in. diameter; saw .312/.318 in. slot. Sta. 6, tap drill (4) for ⅜-16 thread; tap drill (4) for $\frac{5}{16}$-18 thread; core drill (1) 1⅞ in. diameter; drill (1) .260/.265 in. diameter. Sta. 7, tap drill (2) for $\frac{5}{16}$-18 thread; core drill (1) $1\frac{53}{64}$ diameter; core drill (1) $1\frac{7}{8}$ diameter. Sta. 8, countersink (4) for ⅜-16 thread; countersink (6) for $\frac{5}{16}$-18 thread; drill (2) ¼ diameter ⅛ deep. Sta. 9, tap (6) $\frac{5}{16}$-18 thread; tap (4) ⅜-16 thread; tap drill for ⅛-27 pipe tap from rear. Sta. 10, ream for ⅛-27 pipe tap from rear.

Sta. 11, drill for .347/.350 in. reamer from front. Sta. 12, tap ⅛-27 pipe thread from rear; ream .347/.350 in. diameter from front; tap drill (1) for ⅜-18 and (1) for ½-14 pipe threads from end; tap ⅜-18 and ½-14 pipe threads from end. Sta. 13, automatic unload. Production is 60 parts an hour at 80% efficiency; floor space required by the machine is approximately 369 x 128 in.

T-1-35

For further information on Tools of Today use the handy coupon appearing on page 82.

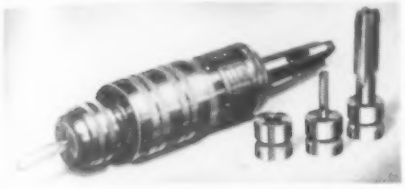
Adjustable Torque Thumb Screw



An adjustable Torque Thumb Screw that will not only hold at the proper tension during machining, but which the tool engineer can set to end pressures to meet the requirements of various jobs, is a recent development by the Vlier Mfg. Company, Los Angeles, Cal.

Torque can be set for an end-pressure of from 5 to 50 lbs. and, once set, the pressure is said to remain constant under all working conditions. These screws are presently offered in two sizes, with length of thread studs ½ by 1¾ in. and ½ by 3 in., with additional sizes under consideration. **T-1-31**

Tapping Attachment



A tapping attachment—the Jay-Dee, designed specifically to eliminate costly tap breakage and announced by the Wickman Manufacturing Company, 15533 Woodrow Wilson Ave., Detroit 3, Mich.—does not employ coiled springs to provide driving pressures. Instead, a resilient material, said to be 150 times more effective than spring steel, delivers a safe cutting torque and protects taps regardless of load. The attachment can be used will all types of reversible machines, for horizontal or vertical tapping, for blind or through holes, and is said to be particularly suited for stud driving and for standard hand taps.

Four selective index stations, listed according to tap size on the body of the attachment, provide quick and positive setting for the widest variety of materials. Tap adaptors, supplied for various size taps, are inserted in the master collet and held in place by spring buttons. Only maintenance requirement is lubricant recharging at three-month intervals.

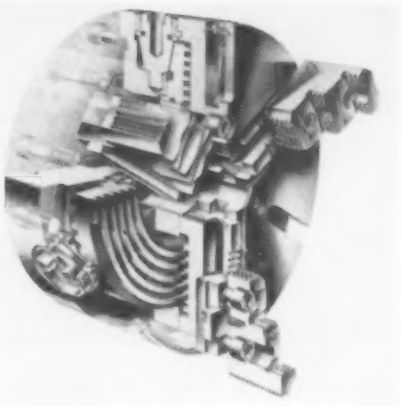
Jay-Dee is available in three models, all supplied with Morse Taper shanks. Model K-1, with a ½ in. to 1¾ in. USS range; Model K-2, which covers ⅜ in. to 1¼ in. USS, and Model K-3, which covers $^{5}/_{16}$ in. to ½ in. USS. **T-1-36**

Extra-Heavy Duty Chucks By W & S

A line of extra-heavy duty 3-jaw geared Scroll Chucks, now being produced in volume by The Warner & Swasey Company, Cleveland, Ohio, incorporates engineering and construction refinements novel to the chuck field and designed to insure long and efficient service under the most rugged operating conditions.

Made in two styles—with serrated step-along jaws, or with American Standard tongue-and-groove jaws—these chucks, which are especially developed for today's higher rates of metal removal, are being built in 8, 10, 12, 15, 18, 21 and 24 in. sizes and fit 6 in. to 15 in. American Standard Flanged Spindle Noses of any machine.

The chuck body is forged of high carbon steel, and the back plate is cast of high-test iron, for good shock-absorbing characteristics; the scroll, machined of alloy steel and hardened to 430 Brinnel, is provided with bronze bushings for long-life protection of wear points and is further fitted with a renewable bronze hub bushing. Each pinion is provided with two replaceable bushings; in addition, a hardened steel, shouldered sleeve is provided at the pinion lug end, resting against the tips



of the pinion teeth to take thrust and radial loads.

Precision machining of all components results in full contact of all bearing surfaces, with maximum stress obtained at full load so that 50% greater efficiency is obtained in pressure applied at the workpiece. Pinion and scroll gear teeth are generated to avoid uneven load concentration and metal deformation, and pinions are separately dimensioned for each chuck size, the teeth having a slight "barreled" form to achieve highest bearing efficiency under load.

The serrated jaw chuck has master jaws with limited travel, major adjustments being obtained by positioning the reversible top jaws, which are adjustable in ¼ in. increments. **T-1-37**

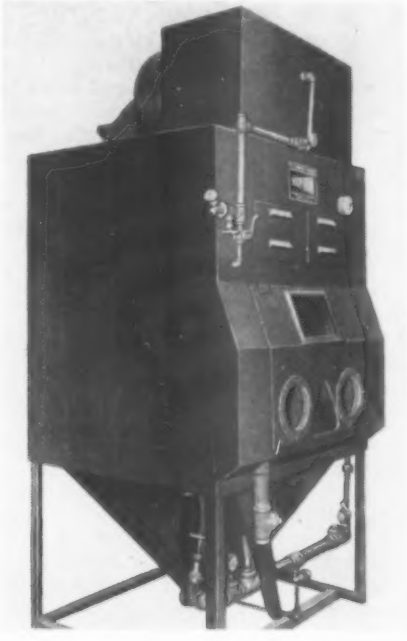
Production Lapping Machine

Precision lapping under severe production schedules is claimed for the Lapmaster, by the Crane Packing Company, 1800 Cuyler Ave., Chicago 13, Ill. The machine is applicable to production runs or individual jobs, can be operated by unskilled workmen, and work handled in one operation may be of different sizes, shapes and heights.

The machine embodies a continuously agitated compound tank, an alloy-iron lapping plate driven by a gear reduction motor, and combined work-holders and wear rings which are held in place by adjustable bars. The lapping cycle time is automatically controlled by a clock, which stops the lapping plate and closes the compound valve at the end of a predetermined period.

Among features claimed is the continuous self-conditioning of the lapping plate, which affords controlled and continuous accuracy in flat, concave, and convex lapping up to 0.000016 in.—a figure less than one light band per inch of surface. Micro-inch finishes of one to three RMS are easily obtained. The continuous conditioning of the lapping surface is a result of the design, which allows the wear rings to wear the lapping plate through the entire lapping cycle at a faster rate than the wear caused by the work.

The Model 12 Lapmaster—shown—is equipped with a 12-inch lapping plate and three wear rings, each with an internal capacity of 4¼ inches, and is one of seven models which will be available with lapping plates of 12 to 72 inches. A companion model—the 41 in. Lapmaster—has a setup of four wear rings and work holders, and is equipped with hydraulic cylinders for lifting the wear rings. T-1-38



Metal Cleaning Machine

Armstrong Chemical and Machine Co., Painesville, Ohio, announces the "Jet Blast" machine for wet abrasive blast cleaning and finishing of metal surfaces. The machine removes rust, scale and undesirable metal particles, such as feather edges on sharpened tools, by projecting a slurry of fine abrasive suspended in water against the surface to be cleaned.

The large permissible variation in abrasive size (60 to 1250 mesh) is said to make it commercially possible to produce finishes as low as 2-3 micro-inches r.m.s. The method produces a matted finish with practically no removal of metal.

Cabinet and frame are water-tight welded steel construction. The siphon jet principle is used for transferring the grit slurry, thus eliminating any pumps or moving parts coming into contact with the abrasive liquid. Therefore, the only wearing parts are the blast nozzles. T-1-39

Recording Vibrometer

A Recording Vibrometer which measures and records frequency, displacement, and wave shape of mechanical vibration, and announced by General Electric's Special Products Division, is built to operate either when mounted on a fixed base or held in the hands.

The vibrometer, which weighs only 7 lbs. and is less than 8 in. in length, was developed by G. E.'s General Engineering and Consulting Laboratory for application in testing all types of reciprocating and rotating machinery within a vibration frequency range of 10 to 120 cycles per second. It records

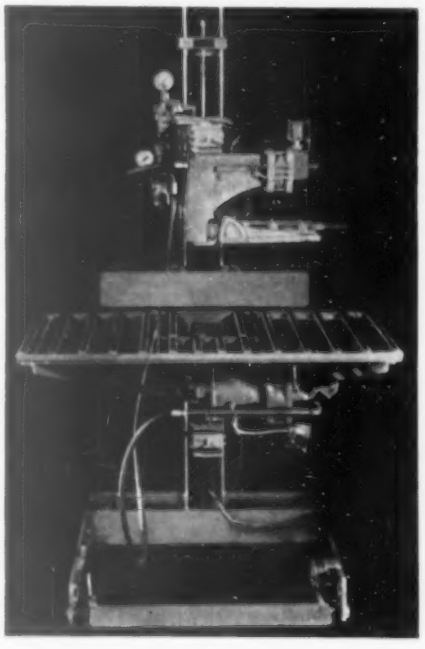
both steady-state and transient vibrations.

A prod, extending from one side of the vibrometer, is set in motion when held against a vibrating body. This motion is amplified by a cross-spring arrangement and transmitted to a stylus which inklessly records the vibration on wax paper, thus making available a permanent record for vibration analysis of equipment. Another stylus produces a timing mark near the edge of the wax paper every one-third of a second. Both the chart speed and the interval between timing marks are governed by a synchronous motor operated from a 115-volt, 60 cycle power supply. Two push buttons are provided to give chart speeds of 1 in. per second and 3 in. per second.

Motion of the stylus on the chart can be observed through a window in the top of the all-aluminum case. One side of the case can be removed easily, for rapid replacement of the wax paper roll when its 50-ft. capacity is depleted.

T-1-40

Stapler for Cartons



The International Staple and Machine Company, Havertown, Pa., announces a pneumatically-operated Staple Machine—Model US-SIS—which closes filled fibre or corrugated cartons from the outside, tops and bottoms simultaneously. Model UAS, for top stapling only, is also available at less cost.

The machine works on the retractable anvil principle. No adjustment for variable carton heights is necessary if the difference in height does not exceed 6 in., and no adjustment is necessary for variable carton lengths.

Both staple heads are equipped with solenoid valves, and the operator trips the foot treadle, which lowers the upper head until contact with the carton is made. This contact automatically sets both staple heads—one for stapling tops, one for bottoms—into simultaneous action. The machine will fit into any conveyor assembly line. **T-1-41**

Use This Coupon for Complete Information On Tools of Today Items Featured This Month

For your convenience, a key number follows the announcement of each product reviewed in the *Tools of Today* section of THE TOOL ENGINEER. To obtain complete information on any of these products, circle the corresponding key numbers on this coupon, and mail the coupon to THE TOOL ENGINEER.

Tools of Today Department, THE TOOL ENGINEER
550 West Lafayette Blvd., Detroit 26, Michigan

Gentlemen:

Please send me further information on the following Tools of Today items which I have checked:

T-1-1	T-1-2	T-1-3	T-1-4	T-1-5	T-1-6	T-1-7	T-1-8	T-1-9	T-1-10
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T-1-21	T-1-22	T-1-23	T-1-24	T-1-25	T-1-26	T-1-27	T-1-28	T-1-29	T-1-30
T-1-31	T-1-32	T-1-33	T-1-34	T-1-35	T-1-36	T-1-37	T-1-38	T-1-39	T-1-40
T-1-41									

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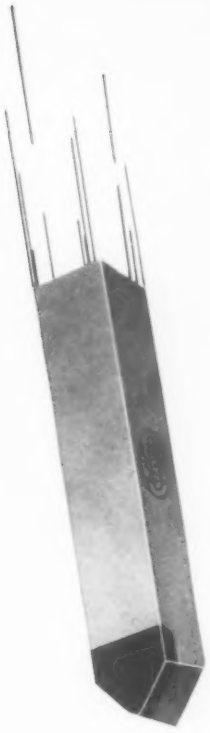
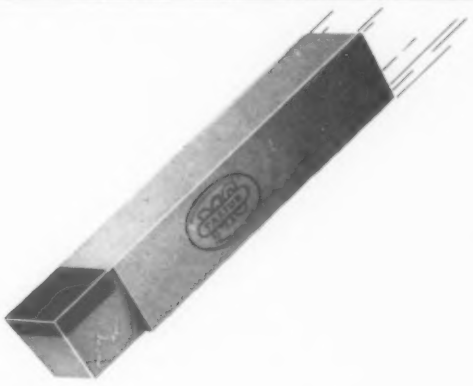
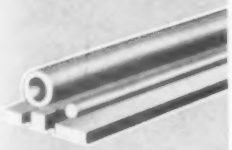
Talide
(TUNGSTEN CARBIDE)

Cutting Tools





TALIDE METAL MEETS EVERY REQUIREMENT



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Faster cutting than other tools, Talide Tools and Tips wear much longer and require only infrequent redressings. Same long-run advantages whether you machine steel, cast iron, non-ferrous metal or non-metallic materials.

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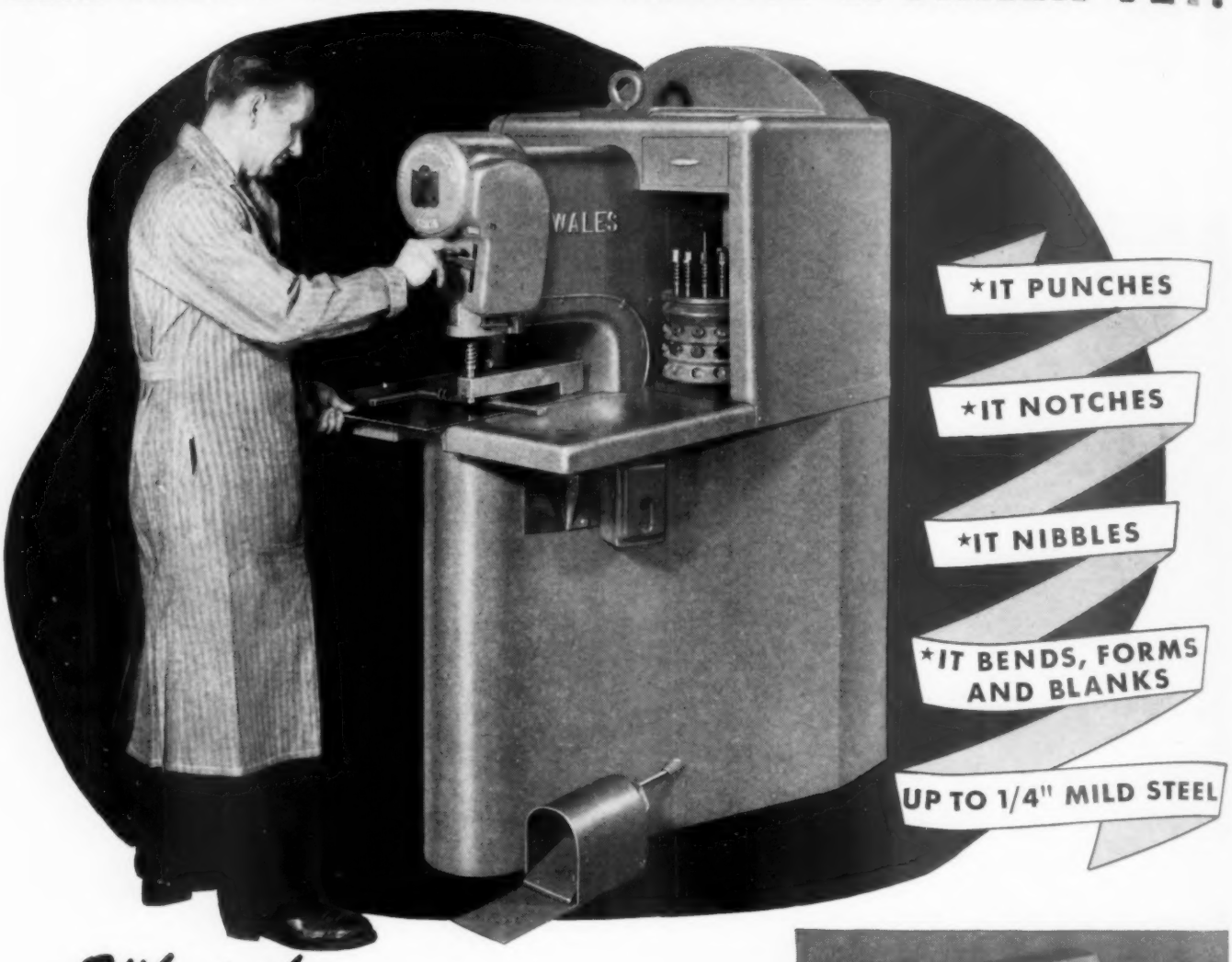

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with the exclusive NO CLUTCH ••• NO BRAKE HYDRA-NEW-MATIC DRIVE

WILL DO FOR YOU★

● Only once in many years is an *entirely new machine* introduced to metal fabricators. The unique Wales Fabricator is NEW! Yes, *new* in design . . . engineering . . . construction . . . and operation, but backed by over 7 years of development and over 2 years of continuous testing and operating under actual production conditions. Wales *exclusive Hydra-New-Matic Drive* is revolutionary in its simplicity of design and operation, —so revolutionary, in fact, that vibration and noise is practically eliminated even at 165 strokes a minute.

Wales exclusive "Quick Change" System incorporated in this machine makes possible the startling time study figures at the right.

IT'S TOO BIG A STORY TO TELL ON THIS PAGE SO WRITE FOR THE FULLY-ILLUSTRATED, FUNCTIONALLY-COLORED CATALOG 10-A.

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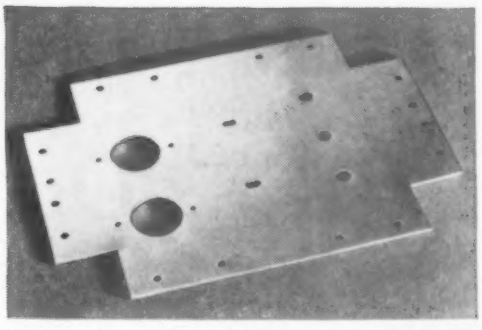
George F. Wales, President

393 PAYNE AVENUE, NORTH TONAWANDA, N. Y.

(Between Buffalo and Niagara Falls)

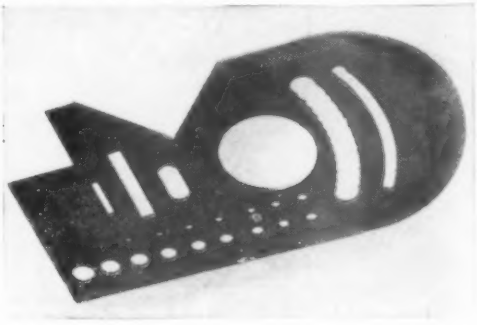
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment



ABOVE: One of 16 pieces punched and notched at an average of only 5-5/6 minutes each. Material .093 stainless steel, 1/2 hard.

BELOW: One of 12 pieces punched, notched and nibbled inside and out at an average of 9 minutes each. Material .093 mild steel.



NO CLUTCH • NO BRAKE BUT SMOOTH INTERMITTENT OPERATION

A TIP TO
TOOL ENGINEERS

Elongated Hole in Small Connecting Rod Broached in One Pass on Automatic Cycle

Small connecting rod forgings are internal broached at the crank end to provide an elongated hole held in relation to a previously reamed wrist pin hole.

American engineers tooled up a T-10-36 3-Way Broaching Machine with a hydraulically operated fixture, special guided broach retriever, and an automatic work clamp to prevent lateral movement of part during the broaching stroke.

In operation, part is loaded with location taken from wrist pin hole and bolt bosses. Machine cycle is started by dual push button controls. The fixture moves into broaching position; retriever unit lowers broach through work into automatic connecting head. Part is automatically clamped prior to engagement of first cutting tooth.

Broach retriever slide guides rear end of broach during principal portion of stroke. At end of broaching stroke, part is automatically unclamped and fixture recedes for unloading. Main machine slide returns broach to retriever which carries it to up position, completing cycle.

★ ★ ★

Above: 1) Two sizes of air compressor steel connecting rod and cap forgings, before and after broaching on *American* 3-Way. The 1.158″ drilled hole in crank end of part is finished to 1.206″ width, elongated 5/32″. Approximately .010″ stock is left on radius for a boring operation after cap is parted off rod by slitting. 2) View of special guided broach retriever which provides broach with guided support during principal part of broaching stroke. 3) Loading slide is designed to allow loading clear of center line of broach. Part is clamped and unclamped automatically.

FREE CIRCULAR ON 3-WAY MACHINE—Full specifications on *American* 3-Way Broaching Machines are given in a new circular. Send for your free copy today and learn how this versatile machine is used for a variety of broaching operations. Just ask for Circular 100T.

AMERICAN

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A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

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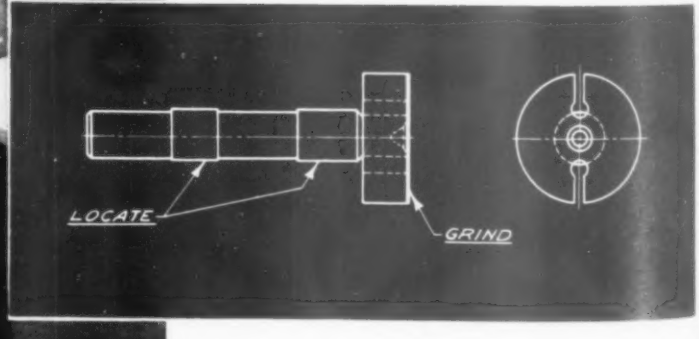
PRECISION and PRODUCTION in the PLUS COLUMN

Heald Column Type Rotary Surface Grinder Replaces TWO other types of Machines—*at a nice profit to the manufacturer*

Doing a better job, faster, with less equipment is industry's answer to the increasing problem of producing goods at a profit. Here's a typical case where Heald engineering accomplished this for a compressor manufacturer—with the Model 261 Rotary Surface Grinder shown at the left. This new Heald machine grinds compressor rotors, 16 at a time, to a .000030 tolerance for flatness; .0006 for thickness; and .00015 for squareness with the shaft. The rapid automatic cycle, multiple station fixture, and complete ease of operation, have materially aided in speeding up production. And, as is so often the case, this one Heald machine does the work of two machines previously used for the same operations.

Why not see what a new Heald machine can do for *your* grinding operations? Your nearest Heald representative—or our engineers here at Worcester—will be glad to help you.

This Heald Model 261 Column Type Surface Grinder is just one of over 30 new Heald grinders and Bore-Matics especially designed for your precision production requirements.



Line drawing of compressor rotor, showing the surface precision ground to tolerances mentioned above.

HEALD

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

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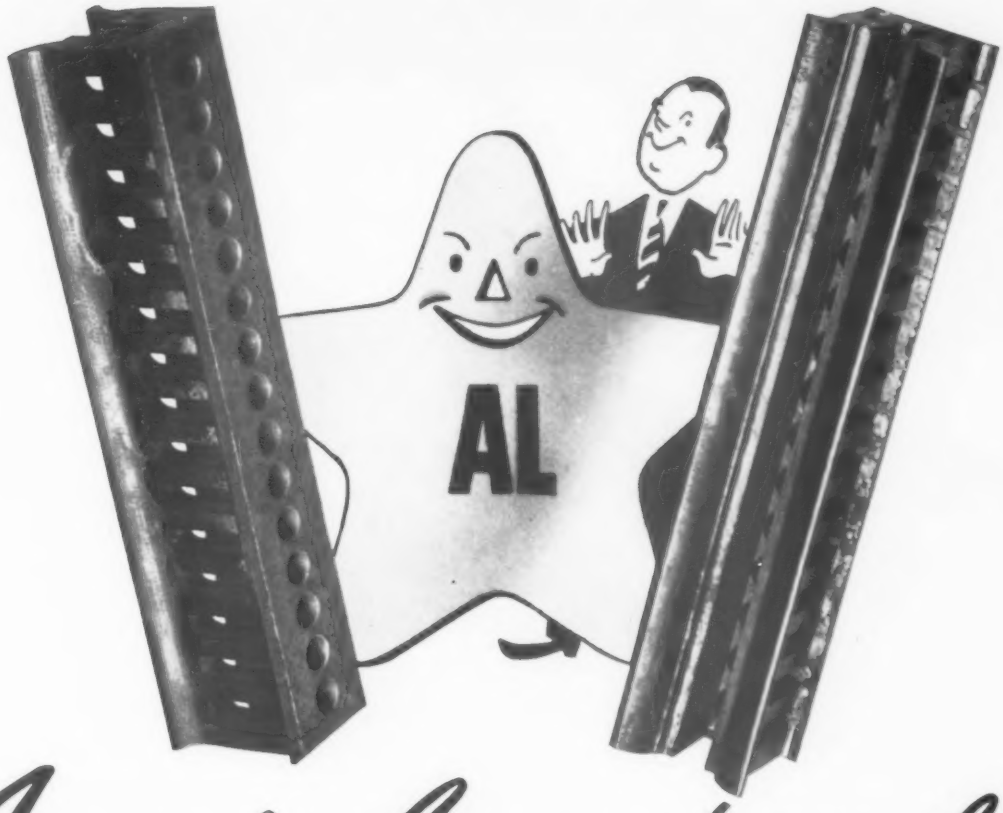

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The Allegheny Ludlum Tool Steel family includes 37 principal types, covering the high speed, hot work, shock resisting, cold die, and carbon and low alloy steel fields. Let us help you find the best answer to *any* problem that occurs in your production or use of cutting and forming tools.

Address Dept. TE-71

Particularly in view of the way it is cut up, the fixture shown above—made of A-L "AIRLOY" (a manganese-chrome-molybdenum air hardening cold die steel)—gave a performance that delighted the user, *and that's what counts!*

The fixture was designed to hold 15 small parts, 1/2" x 3/8", for milling a slot. In heat treatment, each fixture was first preheated at 1150° F., then raised to 1475° F. and held there for 7 to 8 minutes, then air cooled—resulting in a hardness of 62/63 Rockwell C. After a draw at 500° F., the final hardness was 57/58 C. Accurate measurement before and after heat treating revealed that there was *no change in sizes.*

AIRLOY is just one of eight principal types of A-L Cold Die Steels—hardenable from low temperatures, insuring low scale loss and freedom from cracking and distortion. One of these types can help you, and our Technical Staff is always at your service—no obligation.

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TOOL STEEL DIVISION: DUNKIRK, N. Y.

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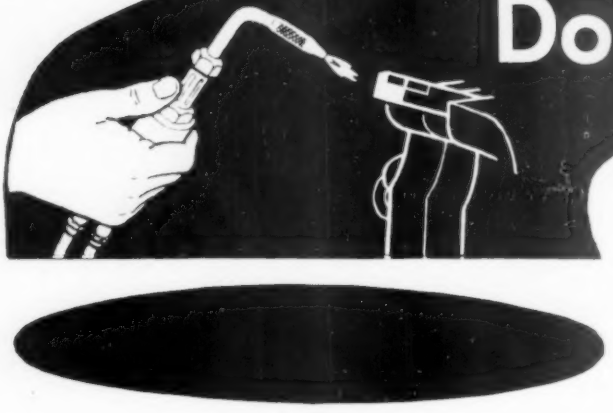

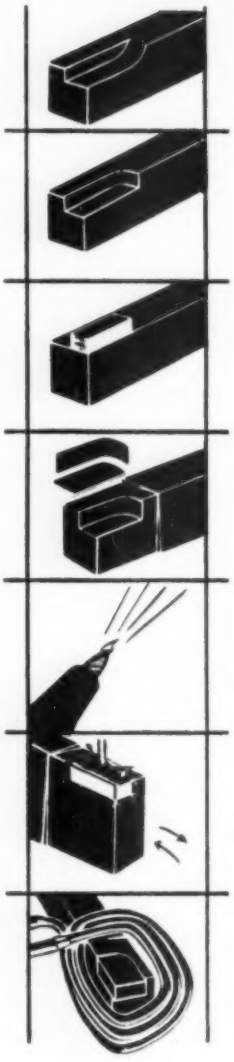

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Brazing your own tools with durable **ADAMAS** carbide is simple, requiring no special equipment or technical knowledge.

How you save money— ★ Shank steel and **ADAMAS** carbide tips are inexpensive. ★ Increased use of present tool room facilities. ★ Preformed **ADAMAS** tips require little grinding with costly diamond wheels. ★ Maintain economical low level of finished tool inventory.

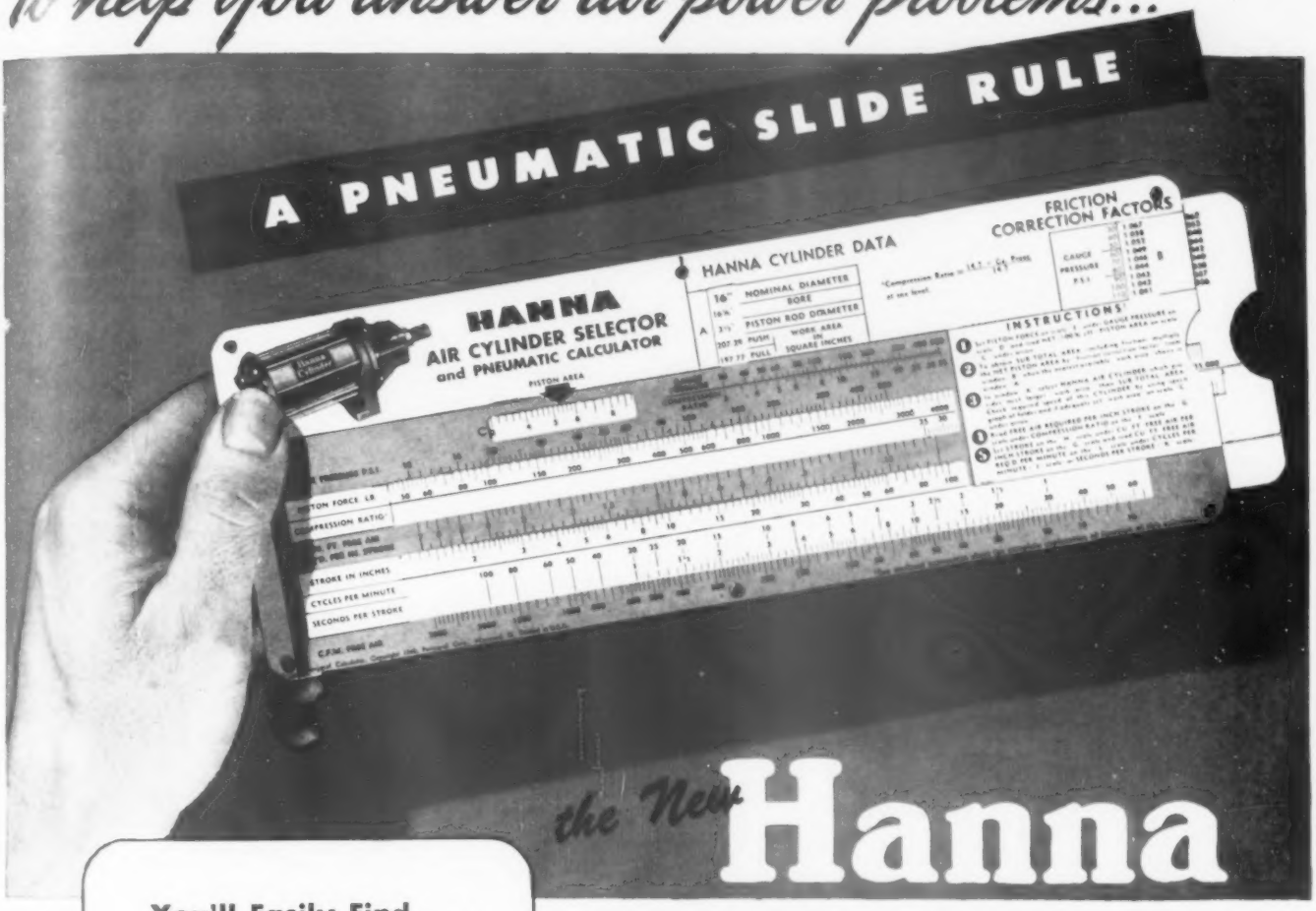
How you save time— ★ Quick delivery on standard and special **ADAMAS** tips. ★ Eliminate costly down time waiting for tools. ★ Direct control of carbide tool production schedules.

Convinced of the advantages and economy for carbide tool users, **ADAMAS** is concentrating on the job of maining the *fastest delivery schedule* of *quality* tungsten carbide *at lowest competitive prices.*

Write for valuable free illustrated booklet "Braze and Save" to Dept.

ADAMAS CARBIDE CORPORATION
1000 South 4th Street • Harrison, New Jersey

To help You answer air power problems...



the New Hanna

CYLINDER SELECTOR and PNEUMATIC CALCULATOR

You'll Easily Find . . .

- Cylinder Diameter
- Required Gauge Pressure
- Force
- Cubic Feet of Free Air Required per Inch Stroke
- Required Horse Power
- Cycles per Minute or Seconds per Stroke
- Pipe Size
- Pressure Drop in Pipes
- Pressure Drop in Fittings

To simplify selection of air cylinders for their 1001 applications throughout industry Hanna now offers a new pocket size "slide-rule." A vast amount of data has been assembled and printed on one small slide that will enable you to find the answers to many air power problems. Starting with known factors the various scales quickly go to work for you and point out such information as shown at left.

An instruction guide is included with each calculator to provide you with detailed information on its operation.

We shall be glad to send you one gratis. Please use company letterhead and ask for the new Hanna Cylinder Selector and Pneumatic Calculator.

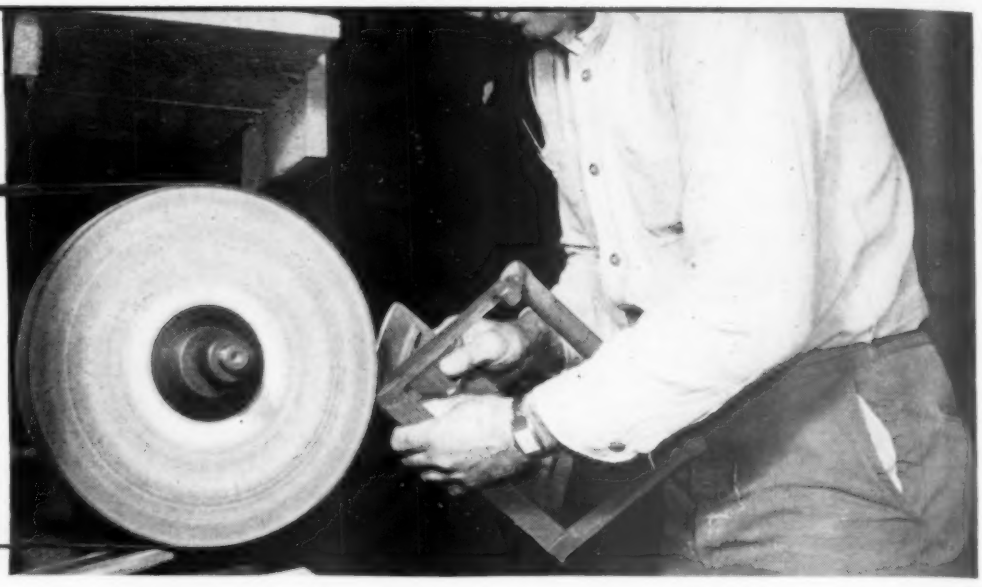
Send for Yours TODAY

Hanna Engineering Works

HYDRAULIC AND PNEUMATIC EQUIPMENT . . . CYLINDERS . . . VALVES . . . RIVETERS

1765 Elston Avenue, Chicago 22, Illinois

THE CASE OF THE FORTUNATE FOUNDRY



Finds a 28% boost in finish grinding air scoop flaps with

METALITE* CLOTH BELTS

When this shop converted from set-up wheels to the belt backstand method, interruptions in production were cut 'way down, one METALITE Cloth Belt outlasting four set-up wheels, permitting almost constant production, with time-out for belt change only one minute. The operation was finish grinding the outside edges of air scoop flaps — magnesium castings. DURABONDED METALITE Cloth Belts, #50-X grit, 2" x 118", were used over soft contact wheels, 16" x 2" x 1¼" rough edge — belt speed, 8500 SFPM. Output jumped to 60 per hour — 28% over the set-up wheel method formerly used, finish was better and costs were cut substantially.

You may find it profitable to check these findings against your production, with a demonstration in your plant of the belt method with METALITE Cloth Belts. Write, wire or 'phone us to arrange it.

GET THE COMPLETE SERIES

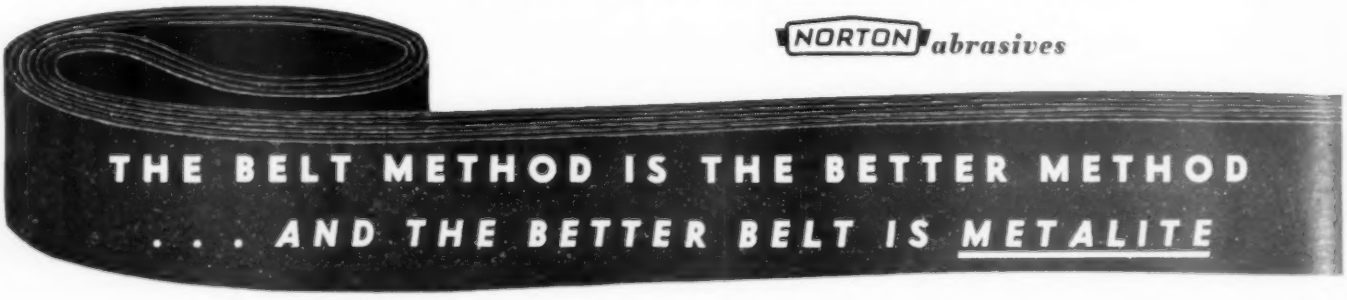
Our booklet "Production Talks Backstands" gives you a whole series of similar case histories with convincing facts and figures. Write for your copy today.

BEHR-MANNING

* *Reg. U. S. Pat. Off.*

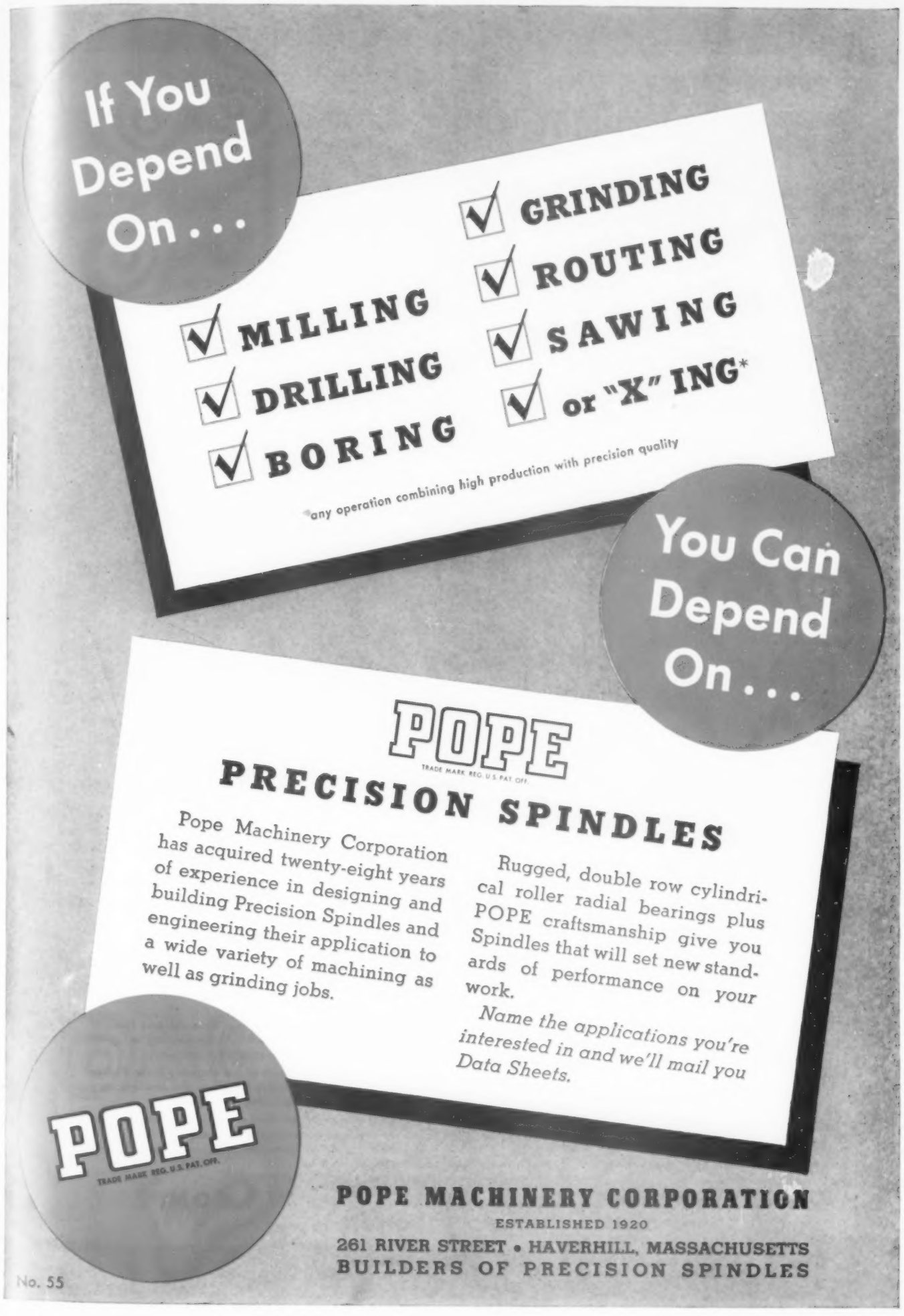
BEHR-MANNING · TROY, N.Y.

NORTON *abrasives*



THE BELT METHOD IS THE BETTER METHOD

. . . AND THE BETTER BELT IS METALITE


If You Depend On . . .
GRINDING
ROUTING
MILLING
SAWING
DRILLING
or "X" ING*
BORING
*any operation combining high production with precision quality
You Can Depend On . . .
POPE
TRADE MARK REG. U.S. PAT. OFF.
PRECISION SPINDLES
Pope Machinery Corporation has acquired twenty-eight years of experience in designing and building Precision Spindles and engineering their application to a wide variety of machining as well as grinding jobs.
Rugged, double row cylindrical roller radial bearings plus POPE craftsmanship give you Spindles that will set new standards of performance on your work.
Name the applications you're interested in and we'll mail you Data Sheets.
POPE
TRADE MARK REG. U.S. PAT. OFF.
POPE MACHINERY CORPORATION
ESTABLISHED 1920
261 RIVER STREET • HAVERHILL, MASSACHUSETTS
BUILDERS OF PRECISION SPINDLES
No. 55

Passed from hand to hand, the work progresses from blank at right to completed part at extreme left. Two punching and notching and two forming operations are performed at each stroke of the press.

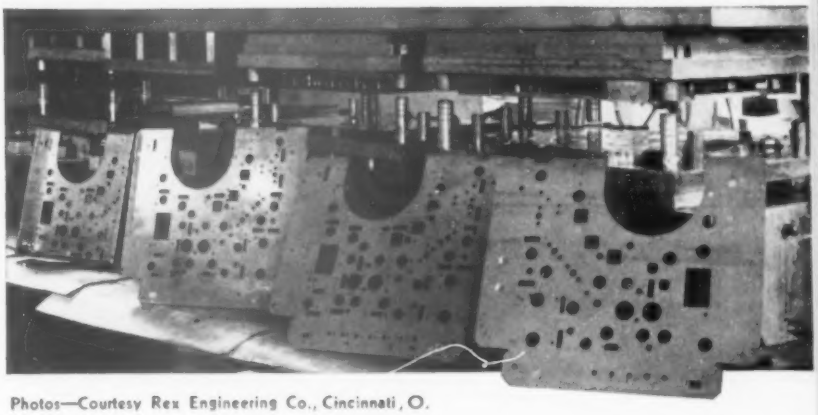
OPERATION TELEVISION...

This television chassis, a modern product made in the modern manner on a Cincinnati Press Brake, is produced from blank to completion in one stroke—four simultaneous operations on one machine.

281 holes, tabs and notches are punched, and three sides are formed at each stroke—to close tolerances.

Cincinnati wide beds and rams—either fixed or detachable—for large area work, are highly productive on jobs of this kind.

You may find you can do it for less on a Cincinnati Press Brake.



Photos—Courtesy Rex Engineering Co., Cincinnati, O.

Write for technical Bulletin 165 a compact treatise on Press Brake practice, dies and applications.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

A DOUBLE SAVING with SCULLY-JONES Style A TAP CHUCKS

① Reduce tap breakage and time lost for changing.

② Speed up production by quick insertion and ejection.

See pages 25, 26, 27, Scully-Jones Catalog No. 500

*In a standard spindle with a Morse Taper Hole

*In Scully-Jones Floating Holder

*In Floating Tension Type Tap Driver for Magic Chuck

*In a Magic Quick Change Chuck

*In a Spring Compression Tap Driver

Universally used for individual or modern mass production, the Scully-Jones Style "A" tap chuck is a one-piece tool designed for driving taps in any type of machine having a spindle, holder or attachment with a Morse taper hole.

True-running, definite stop, positive drive, smaller in diameter than spindle, quick insertion and easy ejection, are advantages that reduce tap breakage and speed up production.

Write for our complete listing of sizes.

5 Big FEATURES

STYLE "A" TAP CHUCKS

1. Drives By Square—a positive drive
2. Centers By Shank—for correct alignment
3. Collet Action—locks tap in chuck
4. Taper Shank—fits any M.T. hole
5. Four Point Bearing—gives collet action

R-1563

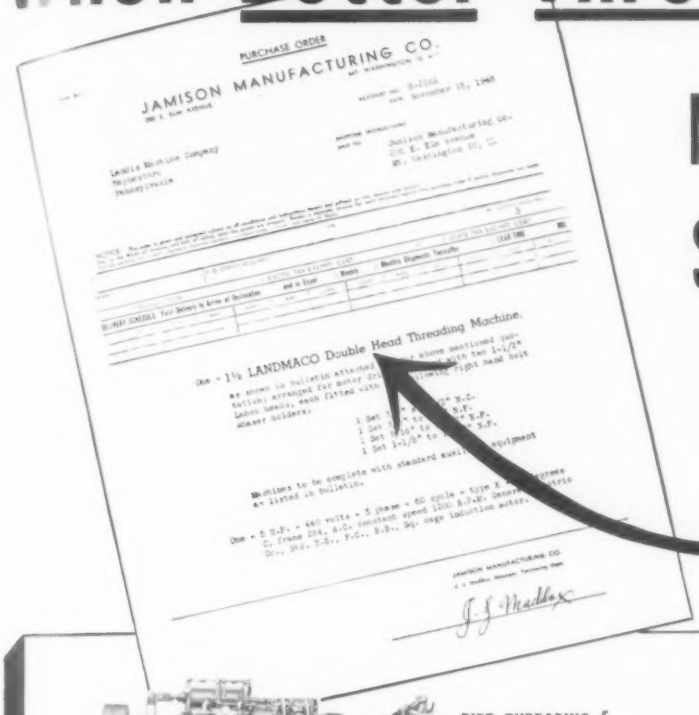
Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

Scully-Jones AND COMPANY

1915 SOUTH ROCKWELL STREET • CHICAGO 8, U.S.A.

When Better Threads Are Needed

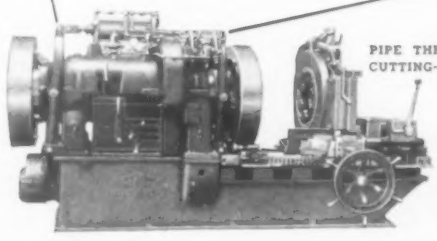
MANUFACTURERS SPECIFY


PURCHASE ORDER

JAMISON MANUFACTURING CO.

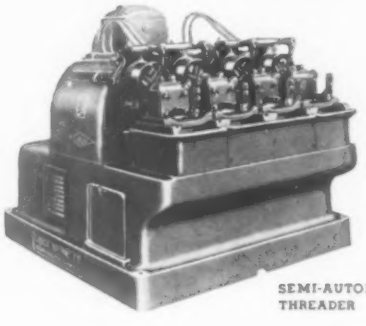
One - 1½ LANDMACO Double Head Threading Machine.

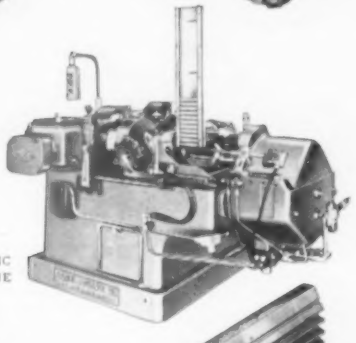
Landis

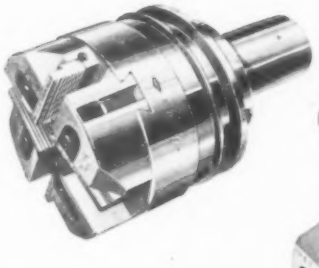

PIPE THREADING & CUTTING-OFF MACHINES

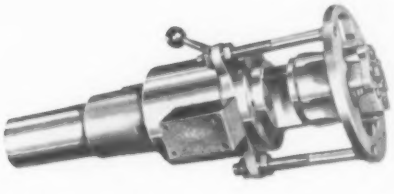

CENTERLESS THREAD GRINDER

LANDMACO THREADING MACHINES

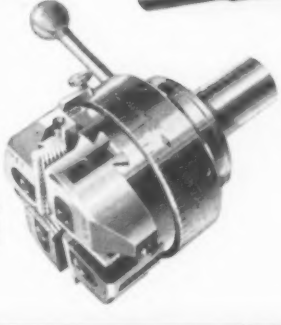

SEMI-AUTOMATIC THREADER


AUTOMATIC NIPPLE MACHINE





THE LANDIS CHASER



Thread cutting die heads and collapsible taps for threading machines, turret lathes, and automatic screw machines.

LANDIS Machine COMPANY
WAYNESBORO, PENNA.

LEADING MANUFACTURERS OF THREAD GENERATING EQUIPMENT

MORE EXTRA FEATURES OF OILGEAR BROADCHING MACHINES

Built as YOU would build them

ERE BROACHING S ACCURATE AND CCURACY IS PERMANENT

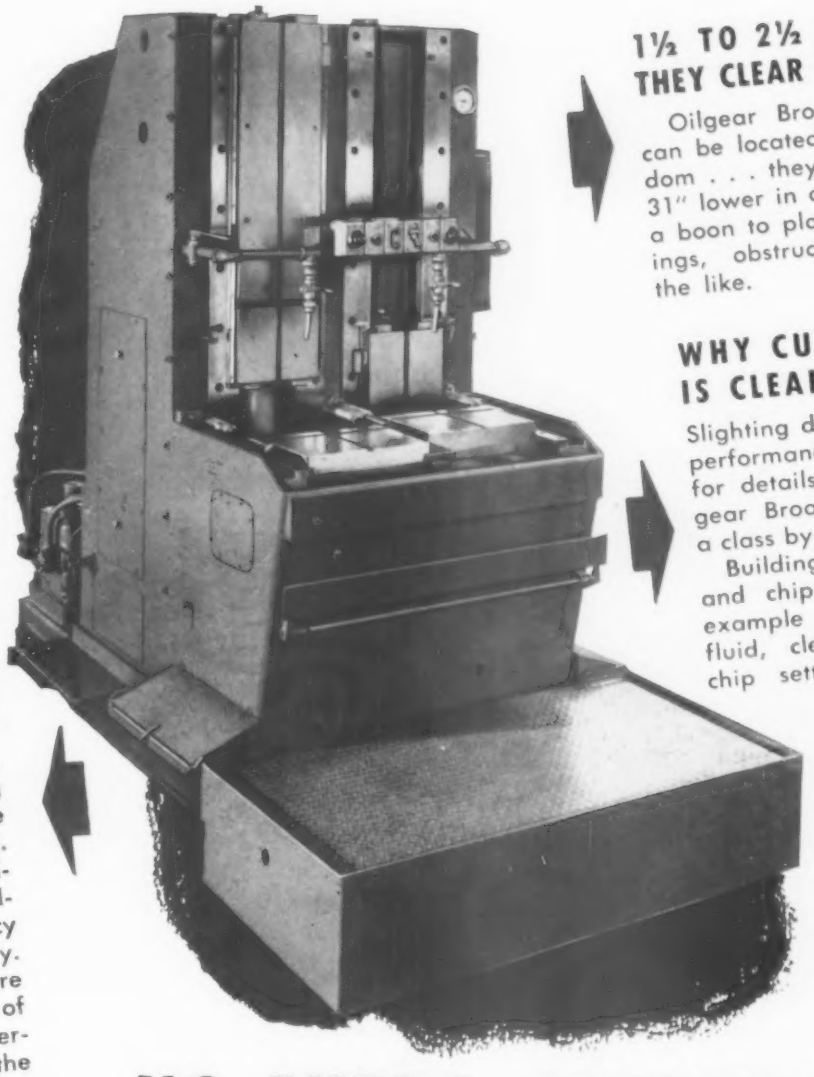
elded machine frames are ugh, sturdy, **homogeneous** uctures. Especially, when designing, welding and anealing are supervised and erformed by Oilgear personel having twenty years' exerience in the manufacture f broaching machine weldments.

The permanent rigidity of Oilgear Broaching Machines in the field testifies to the care the men who build these machines exercise in welding and annealing . . . one more reason why Oilgear Broaching Machines produce so much work at such close tolerances.

HERE YOU SAVE ON OIL COSTS, POWER AND SPACE

For those who can read between the lines . . . Oilgear Broaching Machines use only **ONE FIFTH** the usual amount of fluid power oil. This is possible only because Oilgear Machines have been developed to a high peak of efficiency . . . structurally and operationally.

Heat and power losses are fractional. **You** save up to 80% of oil cost. The very small oil reservoirs save space, help make the whole machine more compact.



1½ TO 2½ FEET LOWER THEY CLEAR LOW CEILINGS

Oilgear Broaching Machines can be located with more freedom . . . they are from 18" to 31" lower in overall height . . . a boon to plants with low ceilings, obstructing cranes and the like.

WHY CUTTING FLUID IS CLEANER—ALWAYS

Slighting details mars perfect performance every time. **Care** for details helps to put Oilgear Broaching Machines in a class by themselves.

Building bigger cutting fluid and chip compartments for example results in cleaner fluid, cleaner work, better chip settling, less frequent chip removal, improved housekeeping. Another detail—you don't have to drain the compartments when inspecting cutting fluid pumps.

NO EXTRA CHARGES—

YOU GET A COMPLETE MACHINE

When you buy an **Oilgear** Machine, you get a **complete** machine. This is what you get in an Oilgear Broaching Machine, **always**, and at no extra charges:

A fluid power system that gives you, within the specifications of the machine, an **unlimited** range of infinitely, independently variable broaching and return speeds. **NOT** a **fixed** range, **NOT** a **low** range.

Complete manual, semi-automatic and full automatic cycle control. You **don't** pay extra for this.

Dual safety-pushbutton control—at no extra charge.

Shuttle tables—at no extra charge.

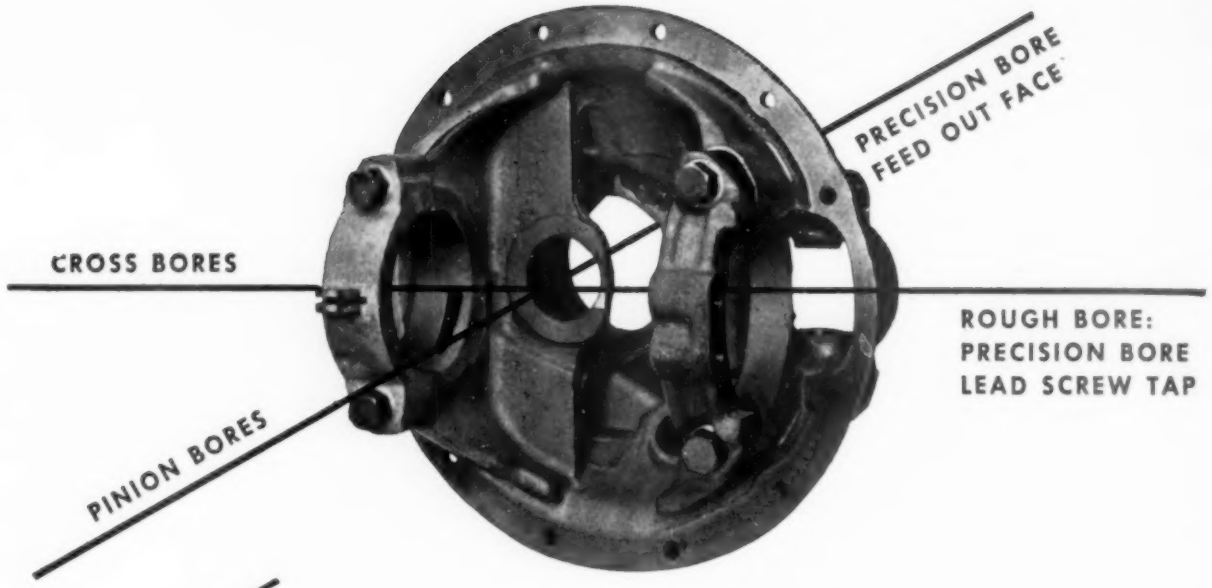
Cutting fluid pump, control, wiring, piping, nozzles, splash guard—at no extra charge.

Up to 130% wider tool slides and work tables—at no extra charge.

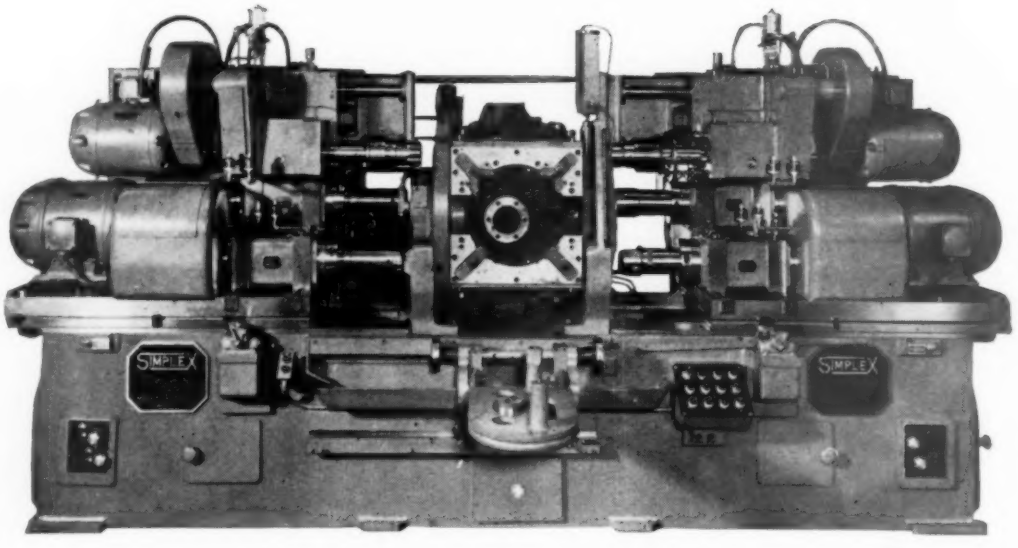
These are just a few of Oilgear Broaching Machine features. Compare what you get in Oilgear—don't be fooled.

Descriptive bulletins are available on all Oilgear Broaching Machines; write THE OILGEAR COMPANY, 1308 W. Bruce St., Milwaukee 4, Wis.

Oilgear Fluid Power



MARKS THE SPOT WHERE *Precision Pays Off*

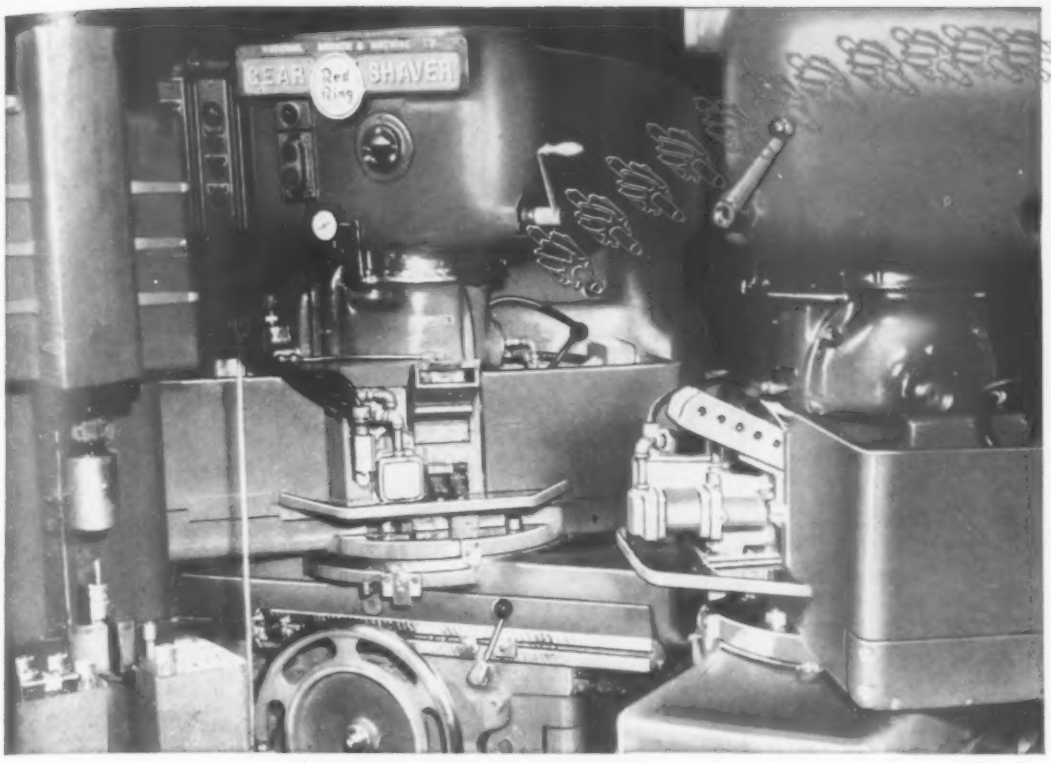


A Prominent Manufacturer of Axles greatly increased production, practically eliminated Axle tear down after assembly and lowered costs with these SIMPLEX 3-way Precision Boring Machines. A four-position indexing fixture permits loading on Station No. 1; Rough Boring Cross Bores on Station No. 2; Precision Boring Cross Bores, Pinion Bore and Feed Out Facing Pinion Bore on Station No. 3; Lead Screw Taping of Cross Bores on Station No. 4. A Production of 40 Carriers per Hour has been achieved on this large Truck type differential Carrier. Smaller Car Carriers would permit considerably higher production rates.

Simplex **PRECISION BORING MACHINES**

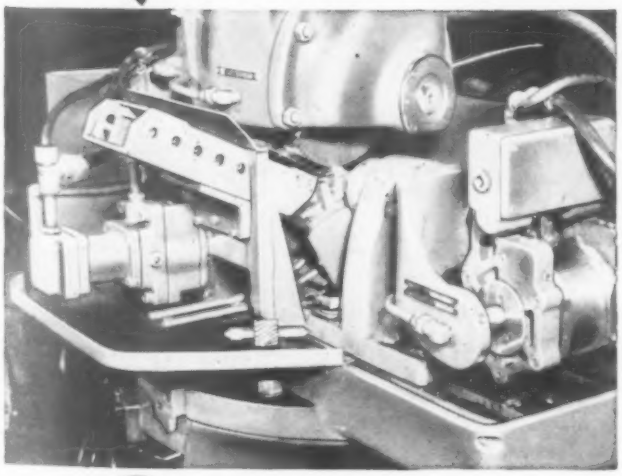
SIMPLEX MACHINE TOOL DIVISION
STOKERUNIT CORPORATION
4528 WEST MITCHELL STREET
MILWAUKEE, WISCONSIN

PRECISION BORING MACHINES • PLANER TYPE MILLING MACHINES • SPECIAL MACHINE TOOLS



automatic loading

Triples Production of shaved gears



The installation of Red Ring Gear Shaving Machines equipped with automatic loaders at the Warner Gear Division of Borg-Warner Corporation has practically tripled production of twelve tooth pinions.

These pinions have a 1" face, 13.5 D.P., 20° P.A. and are DIAGONALLY shaved to the Elliptoid tooth form. Tolerance on the involute is held to .0002". An arbor is pressed into each pinion before going into the loader magazine.

The operator merely feeds the pinions into the loader magazine and removes them when ejected from the machine completely shaved. Both loading and shaving are entirely automatic while the machines run continuously.

Red Ring Universal Diagonal Machines shave gears from 1" to 12" pitch diameter by either the conventional or diagonal methods.

If you are producing precision gears in quantity, ask for descriptive literature on Red Ring Shaving Machines.

5161

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • • • • • • • • • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

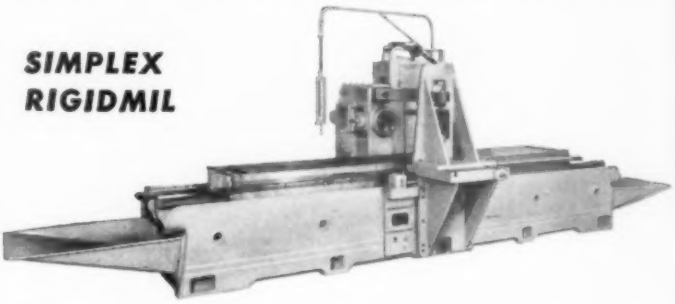
How to Cut

Your Metal Working Costs with Sundstrand Machines and "Engineered Production" Service

Here are some representative examples of machine tools and services offered by the Machine Tool Division of Sundstrand. Standard basic machine designs and units, coupled with methods engineering assistance, has resulted in many cost-saving Sundstrand installations. If you have metalworking operations in your plant, and are interested in lowering manufacturing costs, call in a Sundstrand representative. He'll be glad to assist you in obtaining more economical methods. There is no obligation for this service.

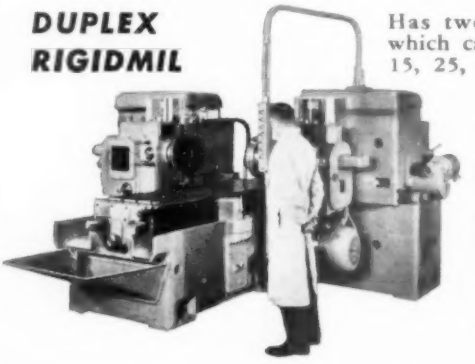
These Machines Plus Engineering Service to Solve Milling Problems...

SIMPLEX RIGIDMIL



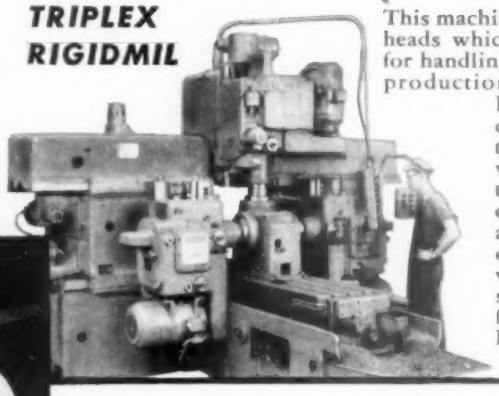
Performs slab or face milling with single spindle. Can be furnished with 25, 30, 40, 50 or 75 horsepower heads. Table widths are 18", 24", or 30", with feed strokes up to 144 inches.

DUPLEX RIGIDMIL

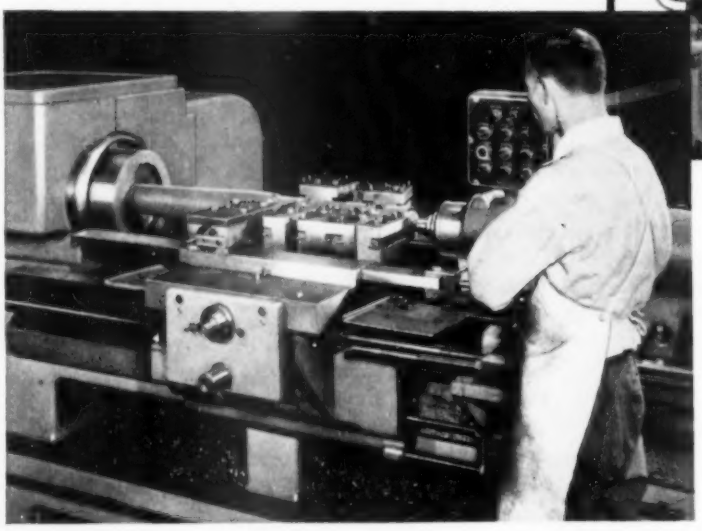


Has two opposed heads which can be furnished in 15, 25, 30, 40 or 50 HP capacities. Table widths and feeds are same as Simplex Rigidmil. Spindle heads mounted onadjustable columns to facilitate wider range of work. Machines can be furnished with power adjusted or fixed columns.

TRIPLEX RIGIDMIL



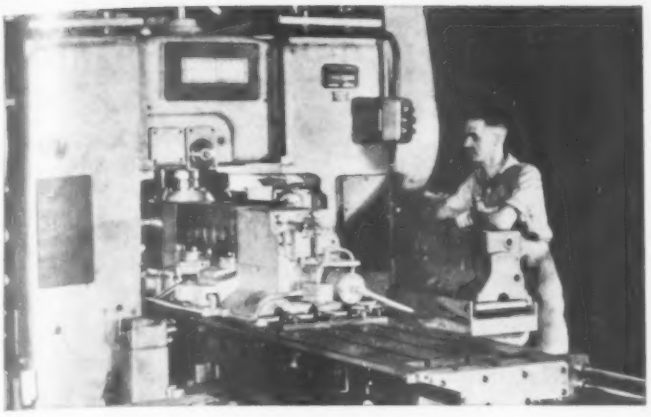
This machine has adjustable heads which add flexibility for handling wider range of production milling jobs. Heads can be operated to mill three sides of a work piece simultaneously or operate individually. Capacity of heads, table widths and feed strokes same as for Simplex Rigidmil.



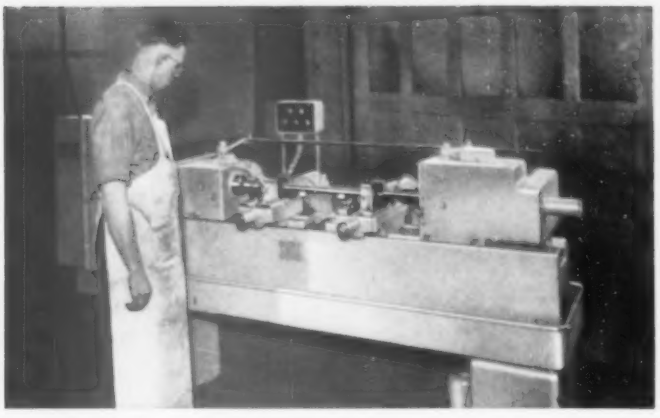
For *Both* Short-Run and Mass Production, Use Sundstrand Automatic Lathes and Engineering Assistance Models 4, 8, 10, 12 and 16 single spindle automatic lathes handle a wide variety of short or long run turning, boring, facing or forming operations. Can be furnished with one, two or three tool heads. Available in varying speed combinations and lengths, with work capacities ranging from 3 to 75 HP.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

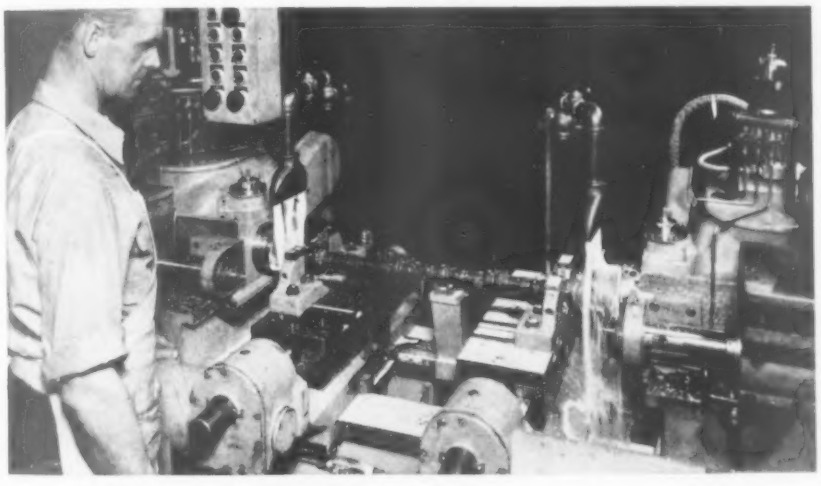
RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT



Special Machines for Milling, Turning, Boring, Centering When standard machines cannot be tooled to suit your needs, or if your production requires the purchase of too many duplicate standard machines, ask Sundstrand engineers to work out a practical solution in the form of a special machine tool. For instance, the machine illustrated above was designed to mill 3 sides of automobile cylinder blocks. Machine has a full automatic cycle.



Centering Machines with Hand or Power Feed Designed and built to drill or center one or both ends of work-pieces prior to turning or other machining operations. Can be furnished with either power or hand control and with a combination of power feed and hand operated vises, or manual feed and power operated vises.



Milling and Centering Machine If your work includes milling to length and centering of either big parts or small parts, you will save time and get more accurate work with a Sundstrand Milling and Centering Machine. It saves time, becuase it mills to length and centers in the same set-up. The work is handled once instead of twice. Extreme accuracy is obtained by performing *both* operations with a single clamping of the part, thereby maintaining a definite relation between the ends and centers.

Shown is a Sundstrand Milling and Centering Machine for handling a range of work from 1" to 3½" diameter and 8" to 48" long. Other sizes of similar machines are available.

Balancing Tools

For balancing, straightening and truing operations . . . Made in 8 standard sizes and types carrying two accurately ground discs mounted on hardened and ground spindles. All discs are carefully balanced, accurately ground and sensitively mounted for true rotation.

Bench Centers

For testing and checking parts between centers. Each bench center includes the bed and two heads. Complete range as follows: 6" by 18", 6" by 36", 12" by 36", 12" by 48", 12" by 60" and 12" by 72".

FREE Complete Data

on any or all of these machines is available. For complete set of literature ask for Bulletins 779.

SUNDSTRAND MACHINE TOOL COMPANY

2540 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

THIS FIRTHITE TOOL TAKES

a thousand blows a minute

A thousand blows a minute, day after day, on an interrupted cutting job . . . that is real punishment for a carbide tipped tool.

FIRTHITE, grade T04, takes this severe assignment in stride—stays sharp, doesn't chip or break—taking a 3/8" cut on a 72" boring mill, boring cast steel gear teeth at a speed of 175 feet per minute. Feed, 0.016" per revolution.

For that tough cutting job in *your* shop, get in touch with a Firthite Engineer.

Call Firth Sterling

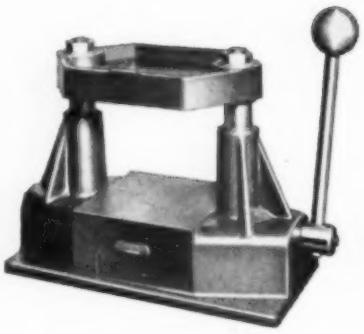
STEEL & CARBIDE CORPORATION

McKEESPORT, PA. • NEW YORK • HARTFORD • PHILADELPHIA • PITTSBURGH • CLEVELAND
DAYTON • DETROIT • CHICAGO • LOS ANGELES
IN CANADA—CHAPAT ENGINEERING & SALES, LTD.

N. A. WOODWORTH

ENGINEERED PRODUCTS

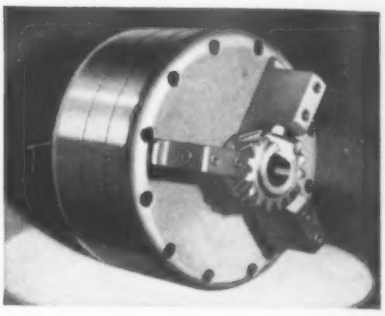
ACCURACY YOU CAN TRUST



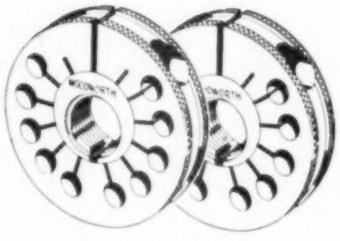
CONE-LOK JIGS

Chucks engineered and built by Woodworth guarantees the ultimate in precision gear chucking.

Woodworth Cone-Lok Jigs are noted for their mechanical simplicity and "life-time" construction.



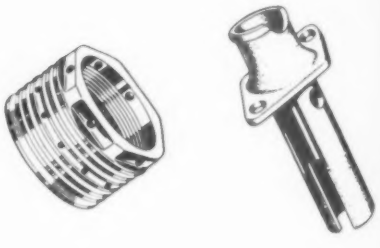
DIAPHRAGM CHUCKS



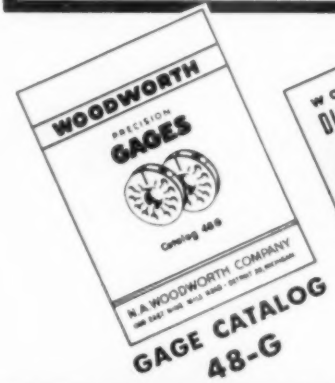
PRECISION GAGES

Woodworth manufactures a complete line of thread ring and thread plug as well as cylindrical plug and ring gages. Also produces special gages to customer blueprints.

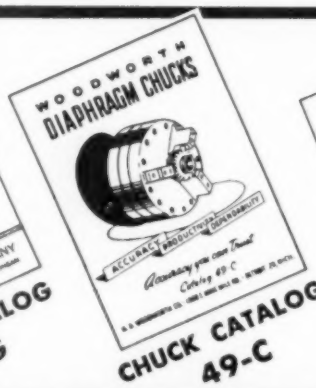
N. A. Woodworth engineering gives you plus value in precision parts. Production men with "know-how" combined with well equipped plant are pace setters in aircraft engine and radar assembly fields.



PRECISION PARTS



GAGE CATALOG 48-G



CHUCK CATALOG 49-C

JIG CATALOG 46-J

WRITE FOR LITERATURE

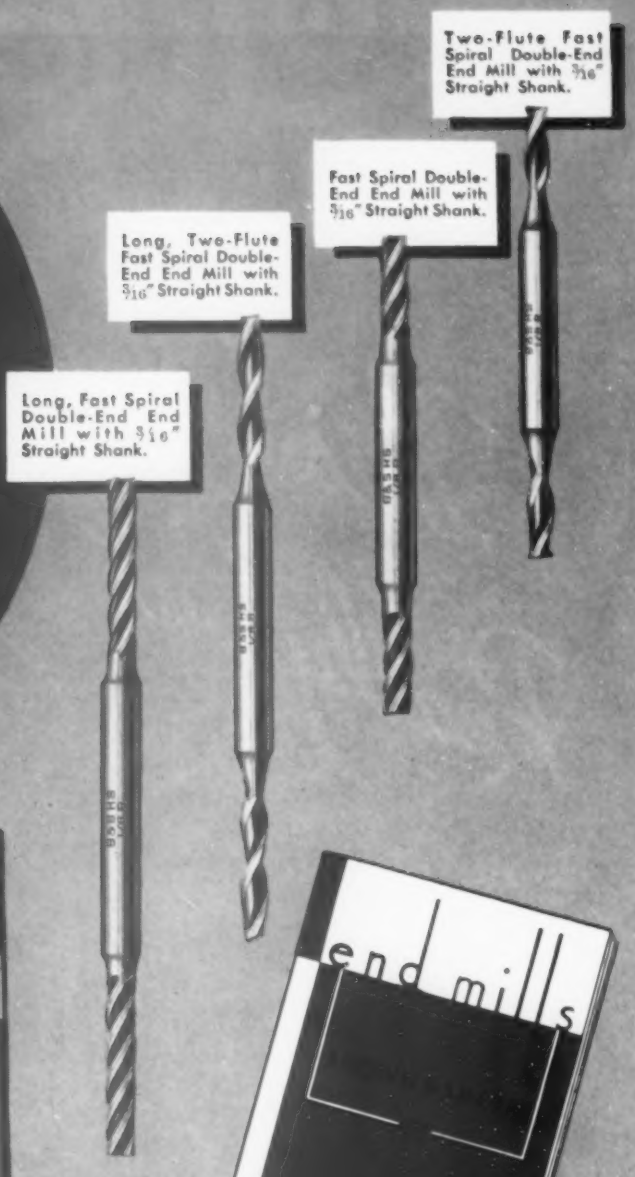
New, comprehensive catalogs on N. A. Woodworth chucks, jigs and gages. Precision parts data supplied upon request for specific information. All inquiries should be on your company letterhead and mailed to address below.

WOODWORTH

N. A. WOODWORTH CO., 1300 EAST NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • DIAPHRAGM CHUCKS • CONE-LOC JIGS • PRECISION PARTS

For More Accurate Selection of Quality End Mills BROWN & SHARPE OFFERS 8 ADDITIONAL TYPES

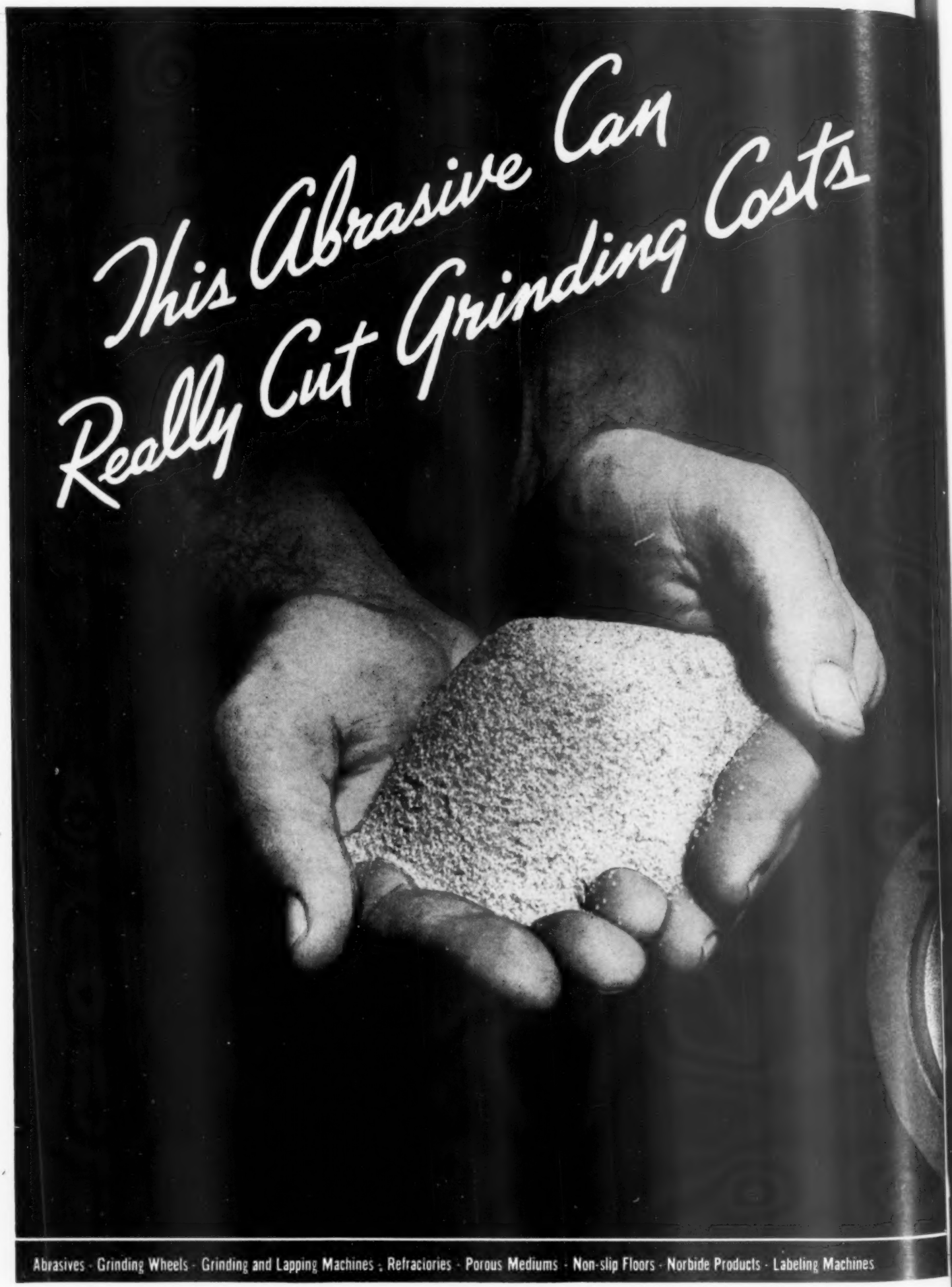


WRITE FOR THE NEW HANDY-SIZE CATALOG

describing important production-improving features of all Brown & Sharpe End Mills together with complete specifications and prices. There's a Brown & Sharpe quality end mill to meet every end milling need. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

BROWN & SHARPE CUTTERS B·S


This Abrasive Can
Really Cut Grinding Costs
Abrasives - Grinding Wheels - Grinding and Lapping Machines - Refractories - Porous Mediums - Non-slip Floors - Norbide Products - Labeling Machines

. . . It's 32 ALUNDUM®

The Sensational Norton Development

Cuts Faster—Cuts Cooler

32 ALUNDUM abrasive is entirely different from any other abrasive—made differently by a unique Norton-developed process. *There's no crushing to size*—each grain forms in the electric furnace as a single, complete, multi-pointed crystal. The result is a grinding wheel that's *sharper*—that cuts faster and cooler.

Fewer Dressings—Longer Wheel Life

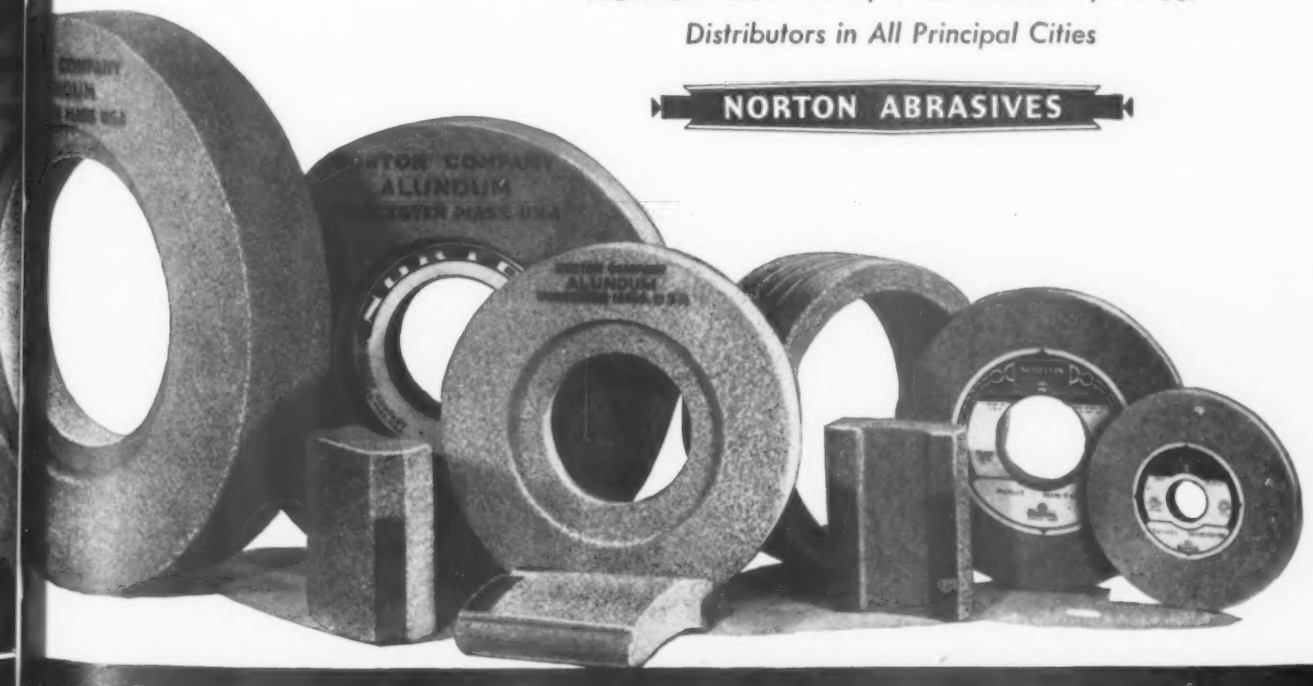
The grains of 32 ALUNDUM abrasive are over 99% pure fused alumina—no non-cutting slag or pores. This means grains with *greater resistance to dulling*—resulting in fewer wheel dressings, longer wheel life.

The cost-cutting ability of 32 ALUNDUM grinding wheels has been definitely proved—by steadily increasing use in thousands of plants. *They can cut costs for you, too.* Try them for cylindrical, centerless, surface, gear, tool and internal grinding. Ask your Norton abrasive engineer or Norton distributor for specific recommendations for your jobs.

NORTON COMPANY, WORCESTER 6, MASS.

Distributors in All Principal Cities

NORTON ABRASIVES



NORTON COMPANY, WORCESTER, MASS., New York, Chicago, Detroit, Cleveland, Philadelphia, Pittsburgh, Hartford, Denver, Los Angeles

A-H5

(5 PCT CHROME AIR-HARDENING)

A-H5 combines the safety of air-hardening with excellent resistance to distortion. It is deep-hardening in large sections and has high resistance to shock and wear. Shown is a ring gauge made of A-H5.

An air-hardening tool steel *that's easy to machine*

Air-hardening tool steels are the best choice for many tools and dies, but the more highly-alloyed of these grades often present machining problems. Toolmakers like A-H5 because this lower-alloy type is annealed to 212 Brinell or less for easy-machining, yet provides the great safety of air-hardening.

A-H5 is recommended for the same tool and die jobs where you are using the standard oil-hardening tool steels such as BTR (Bethlehem Tool Room). A-H5 is of course the choice when a relatively drastic quench in oil is not permissible. And it is preferred when you need deeper hardening, greater resistance to distortion, and higher wear-resistance for cutting edges.

Use A-H5 for dies, punches, blanking tools, cold-forming dies, master tools and the like. Give it a thorough trial and you'll agree that it belongs in your tool room. The nearest Bethlehem sales office or tool steel distributor will gladly give you full details and arrange for prompt delivery.

QUICK FACTS ABOUT A-H5

	C	Mn	Cr	Mo	V
Typical Analysis:	1.00	0.60	5.25	1.10	0.25

Annealing: Pack, heat to 1650 F, slow furnace-cool, Brinell 212 max

Preheating: 1200 to 1250 F, prior to hardening

Hardening: 1775 F, air-quench

Tempering: 350 to 400 F, Rockwell C 60 to 62

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

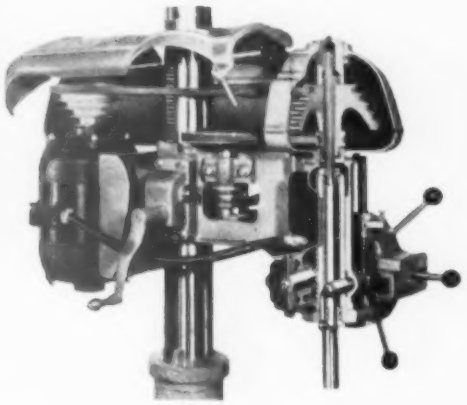
Export Distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

A-H5 ...one of Bethlehem's fine tool steels

FOR EXAMPLE

Model D-1101X Power Feed. Price: less motor and column $245.25
D-1100X Hand Feed. $170.00*



HARLEY-DAVIDSON PERFORMS

110 SEPARATE OPERATIONS

WITH WALKER-TURNER 20" DRILL HEADS

Walker-Turner Light Machine Tools solve a dual problem for the Harley-Davidson Motor Co., Milwaukee, Wisconsin, in the production of their new lightweight model motorcycle. They fill the need for *standard* machine tools capable of handling approximately 110 *separate* drilling, tapping and spot-facing operations, and *eliminate the necessity for replacing expensive, special machines when models change.*

In set-ups devised by Harley-Davidson engineers, over 100 Walker-Turner Drill Heads machine motor, brake plate and crank-case assemblies. The equipment drills holes ranging from ⅛" to 1" in diameter at spindle speeds from 260 to 2600 r.p.m. When necessary, accuracy to .001" is attained. Both high-speed steel and carbide tools are employed.

Here again, Walker-Turner Light Machine Tools demonstrate their flexibility. Compact and rugged, Walker-Turner Light Machine Tools work *all* materials from wood and plastics through tool steel . . . set new high production records . . . give long, trouble-free service.

For complete catalog, write to Walker-Turner Division, Kearney & Trecker Corporation, Plainfield, New Jersey.

Photo, upper left: Progressive machining stages at Harley-Davidson: multiple drilling, tapping and spot facing done entirely on set-ups of Walker-Turner 20" Drill Presses.

Photo, lower left: Facing internal hubs of cast aluminum. Facing tools are mounted in standard Walker-Turner 20" Drill Presses.

**Photo, upper right:* 20" Power Feed Drill Press Head, Model D-1101X, Hand Feed Model D-1100X. 4 ball bearings, 6" spindle travel. Five standard spindle speeds, 400 to 2600 r.p.m. with 1740 r.p.m. motor. Capacity 1" in cast iron, ¾" in steel. . . . . Slo-speed motor optional.

walker-Turner MACHINE TOOLS

DRILL PRESSES—HAND AND POWER FEED • RADIAL DRILLS
RADIAL SAWS • BAND SAWS—FOR WOOD OR METAL
RADIAL METAL CUT-OFF MACHINES • MOTORS

4205

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SUPREME ACHIEVEMENT IN HIGH SPEED STEELS

VASCO SUPREME

U.S. PATENT NO. 2174285

a new cutting material

Performance results show tool life of Vasco Supreme exceeds that of tools made from ordinary High Speed Steels up to five times or more in the machining of plastics, brass, malleable and cast iron, cast and heat treated steels. These results are being obtained from all types of tools including turning and boring tools, milling cutters, hobs, broaches, drills, taps and reamers.

In addition to better tool life the properties of Vasco Supreme make possible increased speeds of 15 to 100% in many instances.

For cost cutting performance let us demonstrate the qualities of this new and revolutionary tool material!

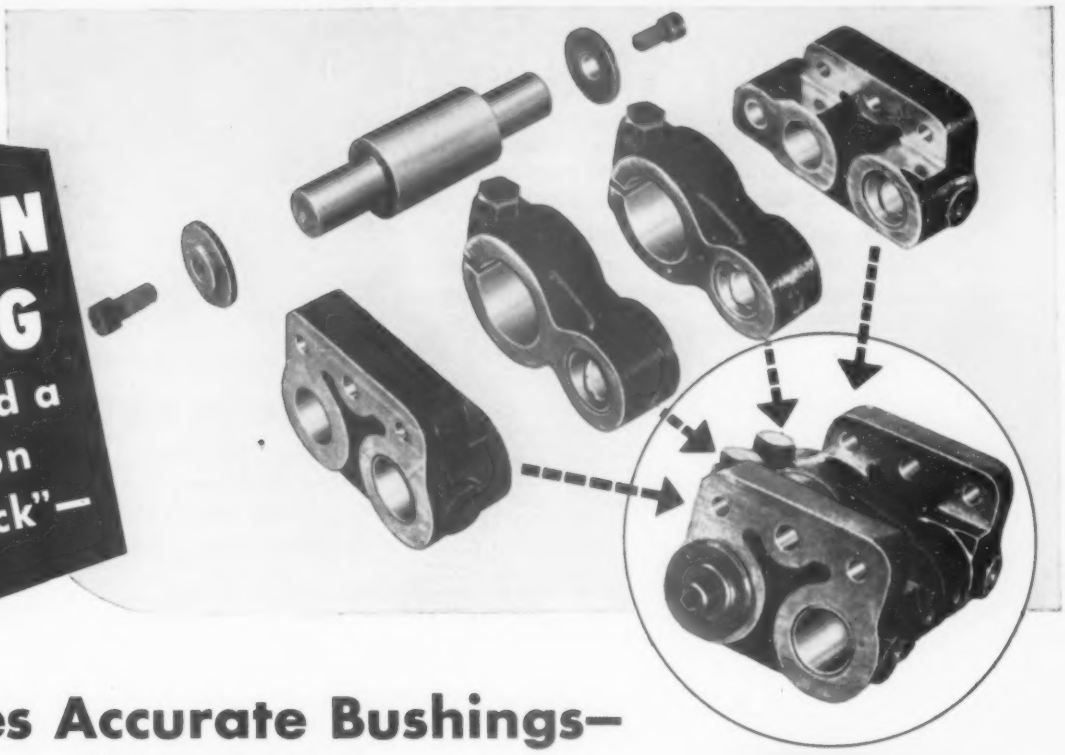
Manufacturers of *First Quality* TOOL and DIE STEELS —exclusively

Vanadium-Alloys STEEL COMPANY

COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL CO.

LATROBE, PENNSYLVANIA

SUNNEN HONING Eliminated a Production "Bottleneck"—



Produces Accurate Bushings— in Perfect Alignment

...At C. B. Cottrell & Sons Co., Claybourn Div., Milwaukee, Wisconsin

A unique problem at this company was to produce sets of four paper gripper bushings to exactly the same size — and mount the grippers in *perfect alignment, spaced on a long shaft.*

Production by lapping was slow — averaged one set of four grippers per day, but Sunnen Honing put this job on a high production basis.

By using a simple fixture (shown above), the four parts are now align-honed to exact size in a matter of minutes. Better parts are produced at less cost, and they now meet production schedules with time to spare.

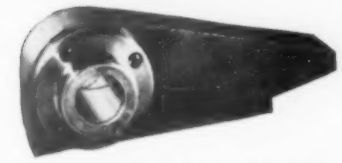
Many other applications in this company's plant prove the versatility of Sunnen Honing. Most applications require extreme accuracy, some are blind holes that must be straight and round — others are bushings that contain keyways. Sunnen Precision Honing Machines handle all of them, quickly and easily.

There may be similar applications for Sunnen Honing in your plant — just as there are in thousands of others.

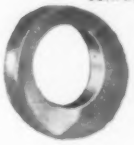
WRITE FOR BULLETIN XMAN-5 for complete details — or request that a Sunnen engineer call at your plant.

SUNNEN PRODUCTS COMPANY 7949 Manchester Ave., St. Louis 17, Mo.

Canadian Factory—Chatham, Ontario



Extreme accuracy on large diameter containing oil grooves



Geometrically true hole—free from bellmouth

Accurate alignment of two holes—with blind end

Smooth, straight, round hole produced in part with keyway

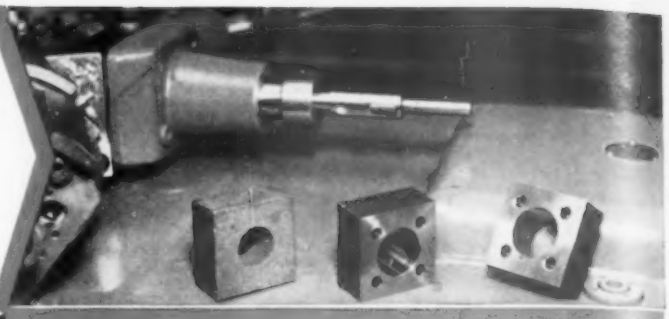
SUNNEN HONING

.402

"Low-cost production of precision holes"

Do it QUICK:

14 machining operations* in 1.49 minutes on this aluminum bronze cam block blank.



Do it ACCURATELY:

On this job, boring, facing, drilling and reaming are accomplished not only at maximum speed but with the exactness specified on the blue print.

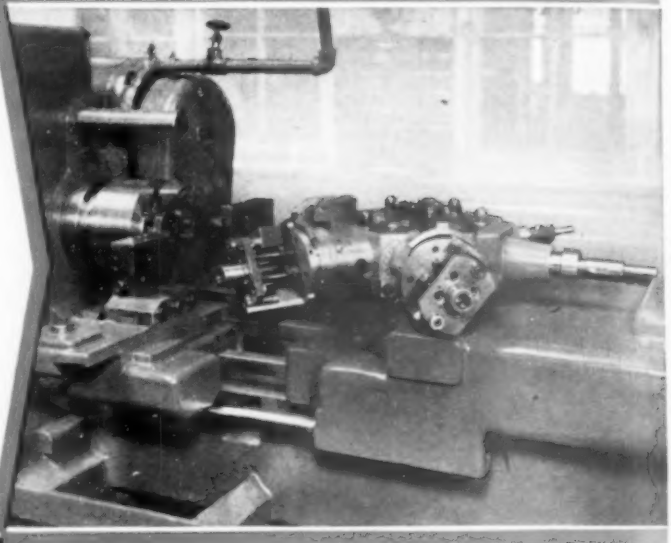
Do it ALL:

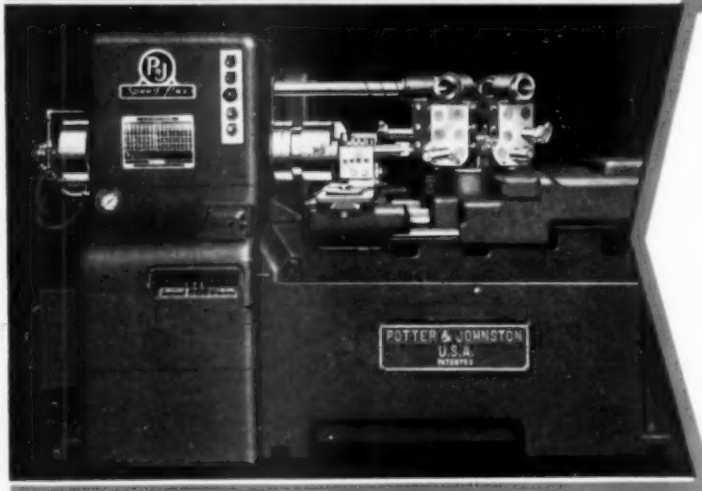
Here's the tooling. *One* setting does the trick. The recessed side of the blank is presented to the spindle and gripped on O. D. with 3 chuck jaws. Then:

1st T. F. — Rough bore hole
Rough face, one side
2nd T. F. — Finish bore hole
Chamfer hole
Finish face, one side
3rd T. F. — Ream hole, 1¾" dia.
4th T. F. — Drill four 19/64" dia. holes on 2" B.C.
5th T. F. — Ream four 5/16" dia. holes on 2" B.C.

*Adds up to 14 operations

Note that even the *drilling* is done on the P&J Turret Lathe — a tremendous time and trouble saver.





Do it on the P&J 3U SPEED-FLEX

— the last word in Automatic Turret Lathes for low cost, quantity production of parts up to 6" dia; equipped with four automatic changes of speed and three automatic feed changes, electro-pneumatically controlled; split second shift from rapid traverse to reverse feed; independent or simultaneous cross-slide operation with selected turret faces or with all six.

Are You Willing to be Shown?

—Potter & Johnston tooling experts will gladly work out tooling and time estimates for *your* small parts production problems. Simply send us parts or prints.

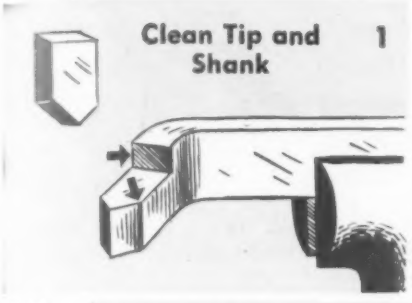
Potter & Johnston Company

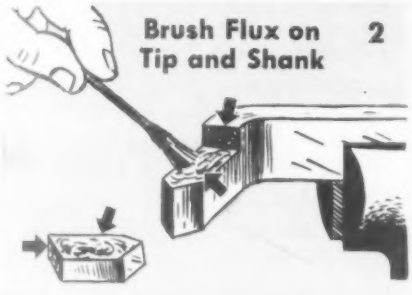
Pawtucket, R. I.

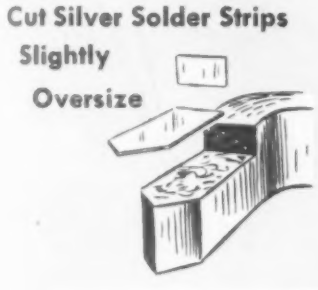
subsidiary of Pratt & Whitney
Division Niles-Bement-Pond Company

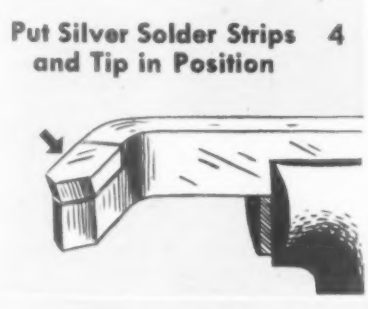
HOW TO MAKE YOUR OWN TIPPED CUTTING TOOLS

The sketches below show how easy it is to make your own tools by silver brazing HAYNES STELLITE tool tips to steel shanks. There are 14 standard shapes of these tips stocked for immediate delivery. Write for a copy of "HAYNES STELLITE Metal Cutting Tools" which illustrates the sizes and types of tool tips available (use the convenient coupon below). You will find prices considerably lower than for solid or welded tip tools.









1. Clean both the tip and the recessed area of the steel shank by light grinding if necessary—then brush with carbon tetrachloride. Clamp shank in vise with bottom surface of recess level.

2. Brush silver-brazing flux generously onto the joint surfaces of both tip and shank.

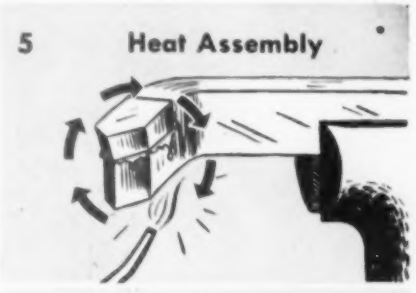
3. From 0.003-in. thick silver solder strip cut pieces slightly over-size for the joint faces of the recess.

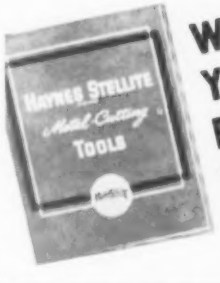
4. Position the brazing alloy strips and place the fluxed tip in the shank recess ready for heating.

5. Use an oxy-acetylene blowpipe with a reasonably large tip and adjust for a reducing flame. Heat the shank underneath the tip to a cherry red, rotating the flame from bottom to side to top to other side to bottom. (For large quantities of tools, you can do this heating in a furnace at approximately 1450 deg. F.)

6. When the silver alloy melts, move the tip with a rod or tongs into exact position, and then press it just enough to squeeze out excess flux and silver solder. Allow the assembly to air-cool. *Do not quench!*

7. When the assembly is completely cool, remove the excess flux and scale. The tool is now ready for grinding.





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USE THIS HANDY COUPON

Haynes Stellite Company, 725 S. Lindsay Street, Kokomo, Ind.

Please send me, without obligation, your booklet, "HAYNES STELLITE Metal-Cutting Tools."

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COMPANY_____

ADDRESS_____

Quick pay-off - - 2 case histories

Automatic drilling and tapping machines pay for themselves in 1 to 3 years by cutting costs of high production parts to pennies.

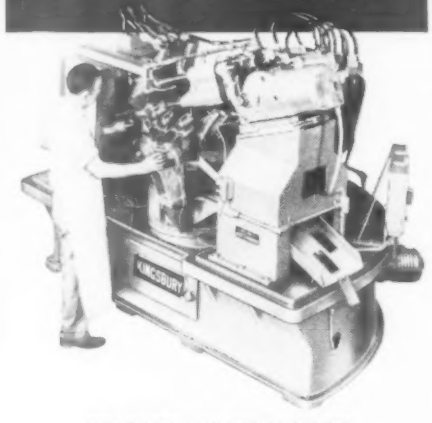
Dear Sir:

These 2 machines save money. That is the only reason for their existence.

They will pay for themselves in 1 to 3 years. Their owners, like all our customers, are impatient to get their investment back. If a Kingsbury's pay-off period ran over 3 years, they would keep on using their old equipment.

How automatic machines cut costs

Operations are in accurate location. (Bushings guide drills and reamers. One chucking instead of several.)



750 PARTS AN HOUR GROSS

While the man drops 3 hinges into nests, the machine clamps and drills 3 parts, reams 3 parts and ejects 3 parts down the chute. Then he presses a lever and the table indexes.

- 2 units drill from opposite ends at the left station. One unit reaches across the index table to drill from the rear.
- The rear unit reams both pin holes with a 6-inch stroke.
- Air cylinders operate levers to clamp the work automatically.
- All units have 3-spindle auxiliary heads to work on 3 parts at once.
- The machine can operate on similar hinges.
- Bushings guide the drills.
- An interlock prevents the table from indexing until every tool is withdrawn.

Parts are uniform. (Automatic cycles do not vary. Fixtures are identical duplicates.)

Saves floor space. Reduces handling.

But the real big reason is this: More output per man-hour. The operator chucks the work. The machine finishes the job. You can say this about a Kingsbury: Cost is low when production is high.

Sad to say, the opposite is also true. Cost is high when production is low. If you have a tough problem with accuracy or uniformity, a Kingsbury may *still* be a good investment. But if your production runs are short and you do not worry about accuracy, you might just as well turn the page.

Kingsburys do many different jobs

Jobs can be simple or complex — operations few or many, from one direction or several, simultaneous or successive. Holes can be from the smallest up to 1 inch (5 hp).

To find the most efficient setup for each job, we select from a complete line of standard equipment. Just look: 12 automatic drilling and tapping units with 82 standard attachments; 8 standard units and 18 standard bases. There are 4 basic types of indexing machines and 2 types that do not index.

What standard units do

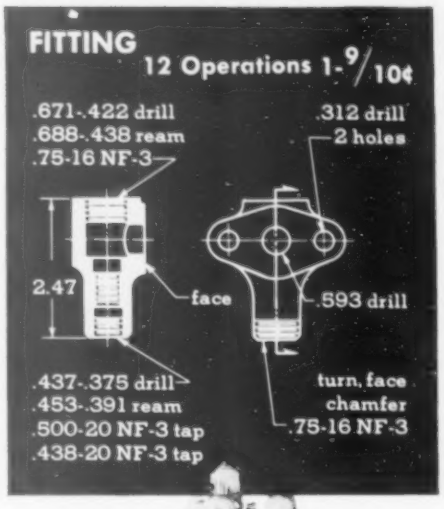
Kingsbury units drill, tap, counterbore, hollow mill, thread, spot face, ream, etc. Attachments mill light cuts in the same chucking with these operations. Multi-spindle auxiliary heads perform similar operations of about the same speed and feed.

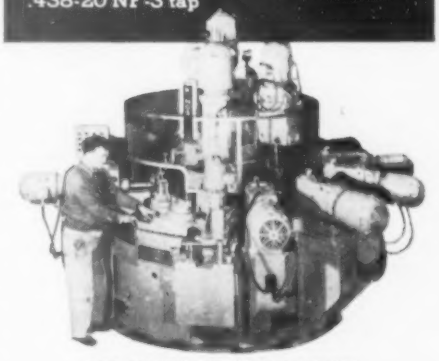
How about sending us a print?

Let's get down to cases. Let us tell you exactly what a Kingsbury can do for you. Send us a print of a high production part and identify the operations and tell us the hourly output you need. If it is complicated, we'd like a sample part too. Our sales manager says it makes the job easier to visualize, but there is more to it than that. He leaves it on his desk; the general manager spies it; a sales engineer joins them. When the argument gets noisy we know they are working out something. You'd be surprised at the ideas they dream up that way. Some of them are darned ingenious.

Sincerely yours,
Kingsbury Machine Tool Corp.
70 Laurel St., Keene, N. H.

P.S. Here is the basis for costs in the case studies. 80% efficiency. Machine paid for after only 6000 hours, a fraction of its expected run. Wage rate above national average. No power or overhead included.





605 PARTS AN HOUR GROSS

When the table indexes, every chuck rotates 180°. Horizontal units can then work on opposite ends of the fitting. While the man changes parts at the loading station, 4 vertical and 8 horizontal units operate on the parts at 11 working stations.

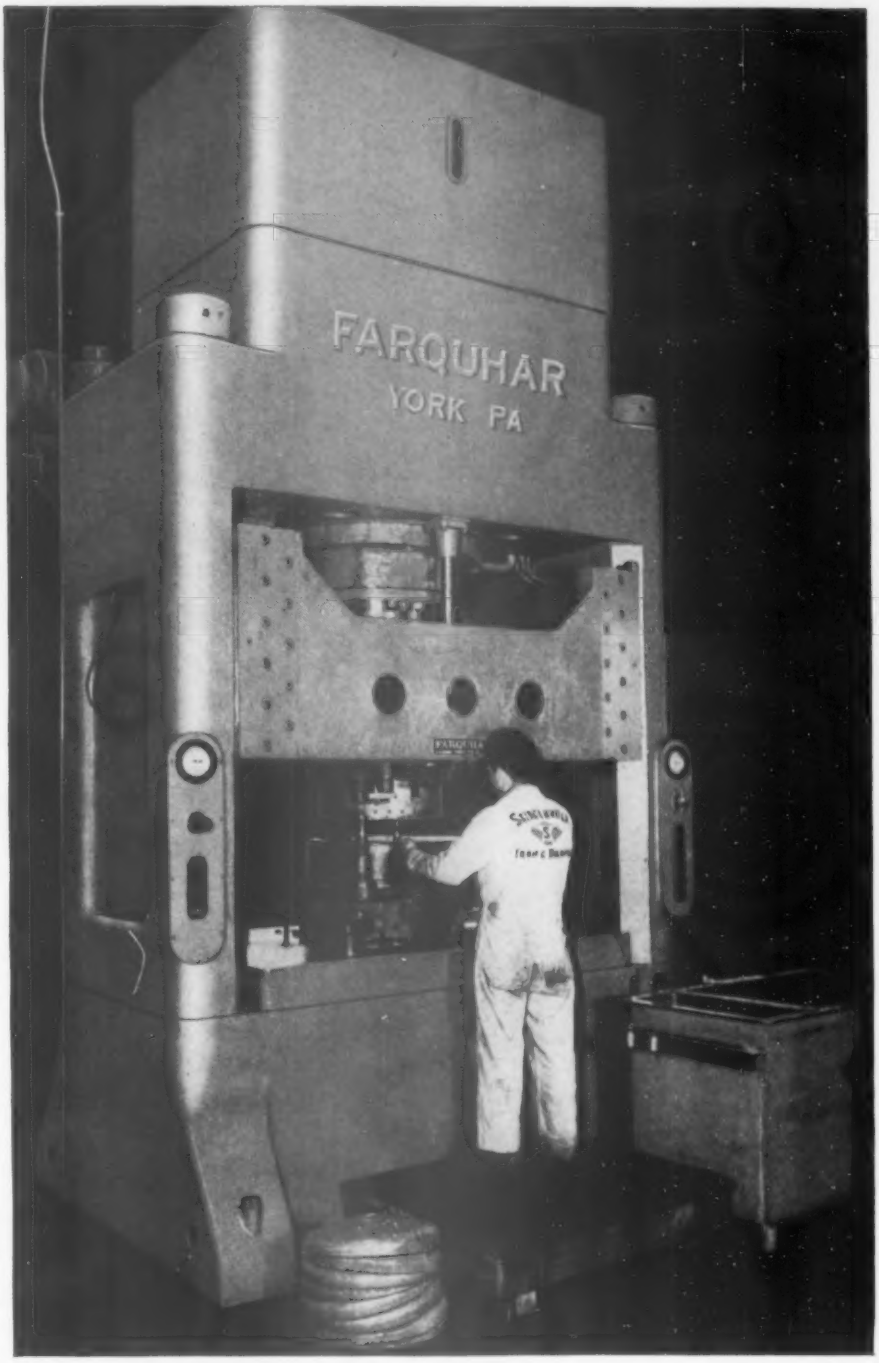
- A power wrench rotates a screw on each chuck to open and close it quickly.
- 12 self-centering two-jaw chucks are exact duplicates.
- Control is all-electric and meets Automotive Electrical Standards. Control devices are in a separate sheet metal cabinet away from the machine (not shown).
- A plexiglas splash guard hangs from the ceiling. The man lifts it to reach the tools.
- Bushing plates pilot onto locators on the chucks to align the tools.
- The column for the 4 vertical units is in the center so all tools are in easy reach. The working area is not caged in.
- Indexing can be automatic or under the control of the operator. He can jog the table part way for setting up or changing tools.

84

KINGSBURY

AUTOMATIC DRILLING
AND TAPPING MACHINES
for Low-Cost High Production

Pacific Coast Plant Betters Production of Hot Water Tanks with FARQUHAR HYDRAULIC PRESS



NO production time has been lost for maintenance purposes since the day this 500-ton Farquhar metal-forming press was installed at the Seidelhuber Iron & Bronze Works, Seattle, Washington.

The Farquhar Press is used for forming heads for hot water storage tanks. Better production is obtained because there has been no machine "down-time" with the Farquhar Press on the job. Smoother operation and improved quality are obtained because Farquhar's hydraulic cushion eliminates wrinkling and tearing.

The Seidelhuber plant is only one of hundreds of users throughout industry who depend on Farquhar Hydraulic Presses for better production. In the shop or on the line, you get the benefits that Farquhar builds into every press: (1) Rapid advance and return of ram *for faster work*. (2) Extra length guides on moving platen *for greater accuracy*. (3) Finger-tip controls *for easy, smooth operation*. (4) Positive control of speed and pressure on the die *for longer die life*. Farquhar builds hydraulic production presses in all sizes and capacities for all types of industry.

Farquhar engineers are ready and willing to help solve whatever production problem you may have, with a hydraulic press that will do your job faster, better and cheaper. Why don't you give them a call?

Farquhar Hydraulic Press, *forming heads for hot water tanks. Nine gauge steel blank material (30" x 30") is used; head is 26" diameter. Only one man needed to place material in press.*

Send for Catalog

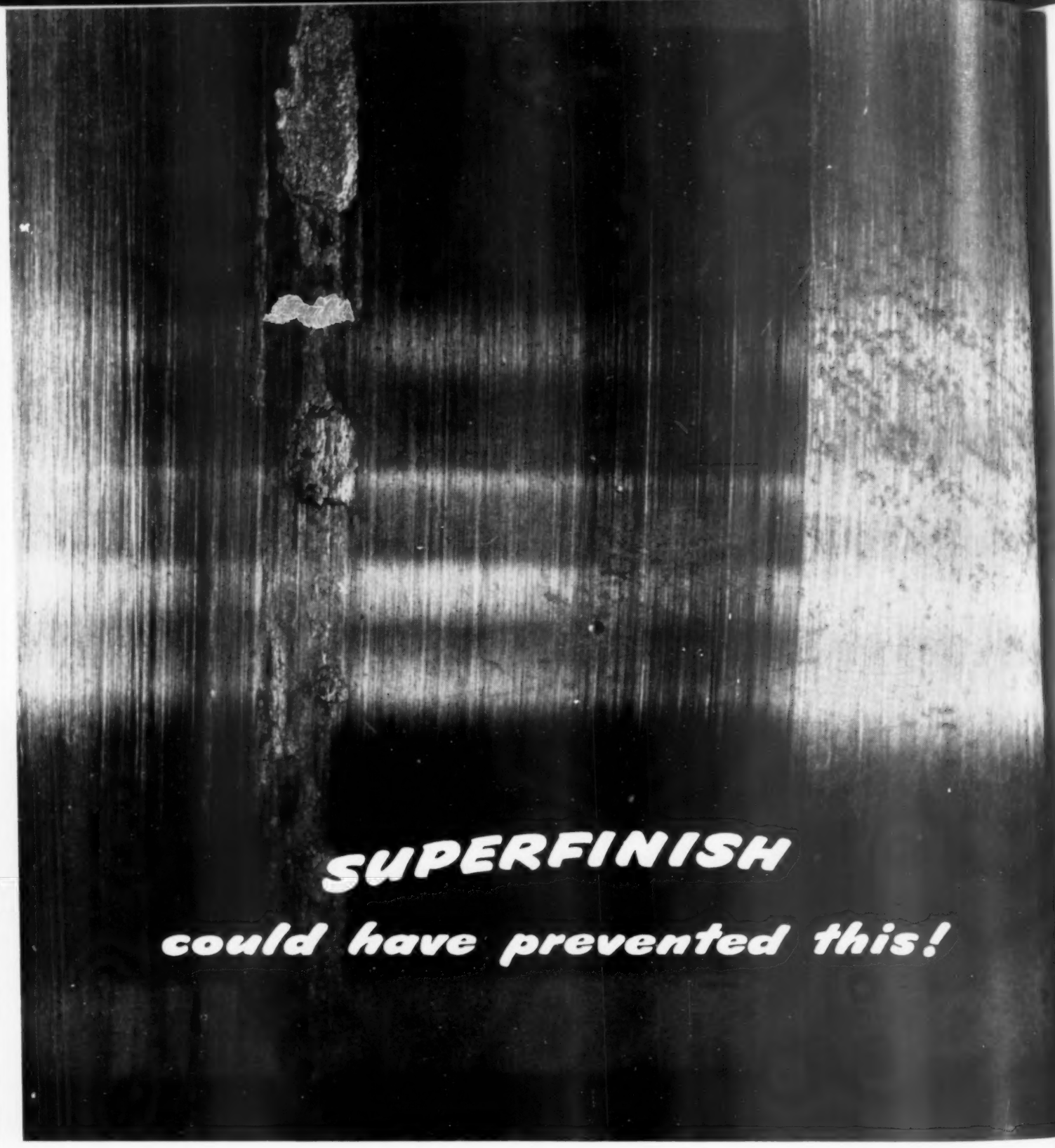
A. B. FARQUHAR CO.
Hydraulic Press Division
1519 Duke St., York, Pa.
Please send me a Farquhar Hydraulic Press catalog.

Name.....

Firm.....

Address.....

Farquhar HYDRAULIC PRESSES
for Bending - Forming - Forcing - Straightening - Hobbing - Assembling Drawing - Extruding - Joggling - Forging - and other Metalworking Operations



Enlargement shows a scored and galled surface of a 3½" O.D. bearing that "froze" and failed. Had this surface first been Superfinished, it would have had nearly twice the load-bearing capacity and about three times the life. "Wear and Surface Finish," is a new textbook on Superfinish. Write for it on your company letterhead.

GISHOLT MACHINE COMPANY
Madison 10 • Wisconsin

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

A head start

—in cutting costs with SUPER-FINISH Universal Drill Bushings

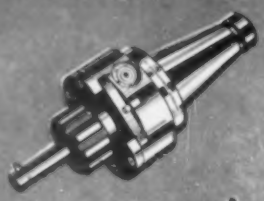
There's longer life in Universal Standard Drill Bushings because the bores are Super Finished. These Super Finished bores *reduce tool breakage and drill wear,* eliminate galling, have no sharp edges on which tools can hang up. Standard sizes available for immediate shipment. Universal warehouses at 89 Main St., Ansonia, Conn., and 5629 Sixth St., Kenosha, Wis., offer *prompt sectional delivery and information.* Cut production costs by specifying Universal Drill Bushings.

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 3, MICHIGAN

Facilities available for special hardened and ground precision parts made to customer specifications.

OTHER UNIVERSAL PRODUCTION TOOLS



BORING CHUCK

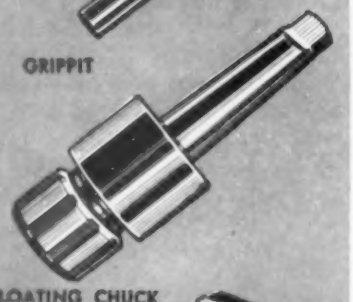
MIKRO-LOK BORING BAR

INDEX PLUNGER

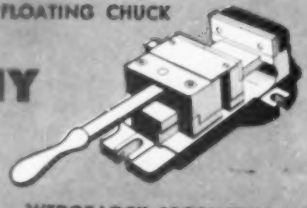
STANDARD DRILL BUSHING

STANDARD COLLET CHUCK

GRIPPIT



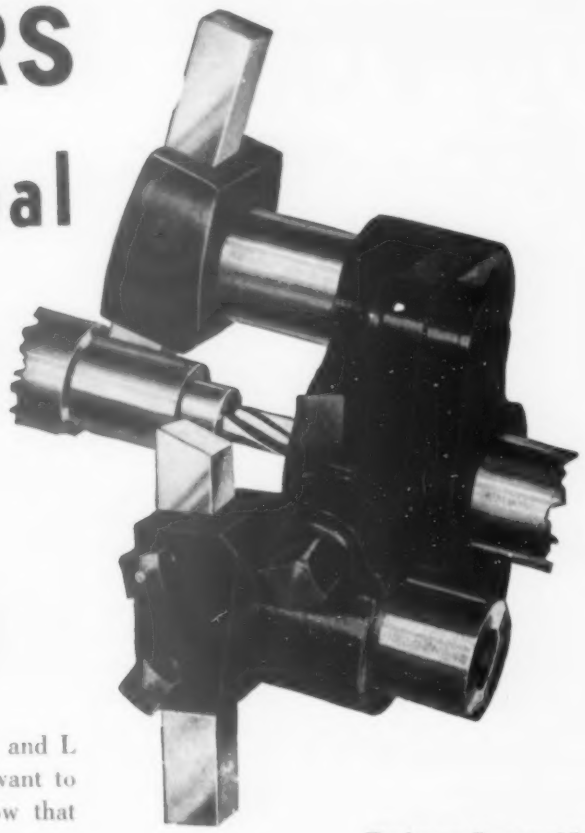
FLOATING CHUCK



WEDGE-LOCK PRODUCTION VISE

ON YOUR TURRET LATHES AND SCREW MACHINES

TOOL ENGINEERS who want additional production capacity always specify R and L TOOLS



Turning two diameters while drilling or reaming is just one of the many operations you can add when you use R and L Tools.

There are two good reasons why we are inserting this series of R and L TOOL advertisements in THE TOOL ENGINEER: Frankly, we want to sell more of our tool holders and, equally as important, we know that your shop will benefit from a dollars-and-cents standpoint when you start using R and L Tools.

For example, consider the R and L tool holder illustrated at right. Two additional operations are completed while a primary operation is being made. There is a complete line of such special R and L Tools to overcome almost every production problem faced by Turret Lathes and Screw Machines. We suggest that you start 1949 right by sending for your copy of the idea-packed booklet showing R and L Tools. It shows a great number of set-ups with R and L Tools which will amaze every cost- and production-conscious Tool Engineer.

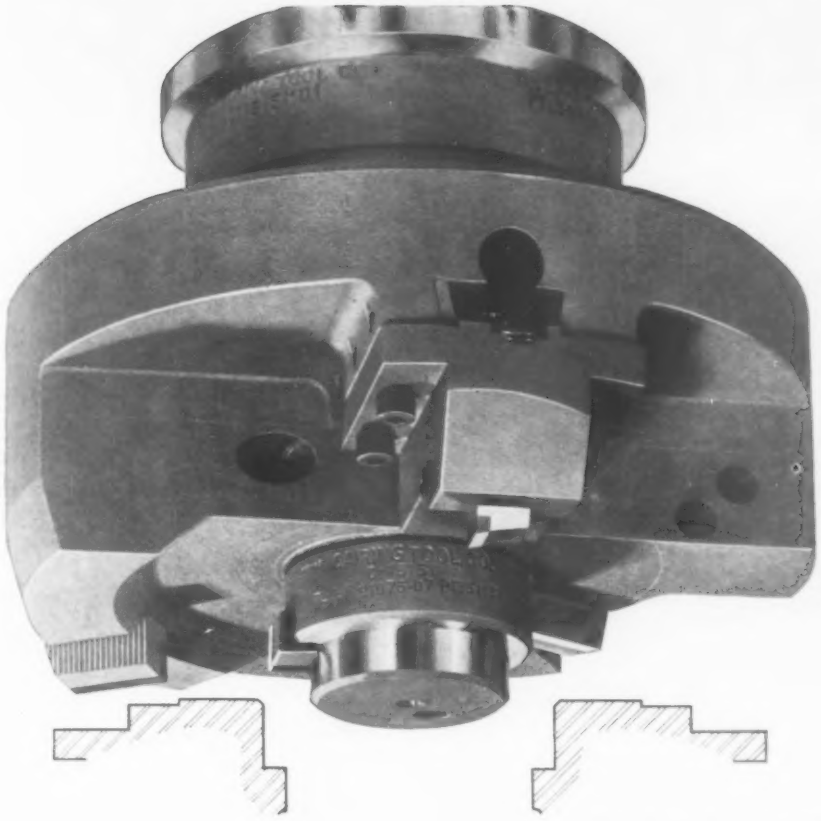
Production Records
Always Tell
The Wisdom of Tooling
With R and L

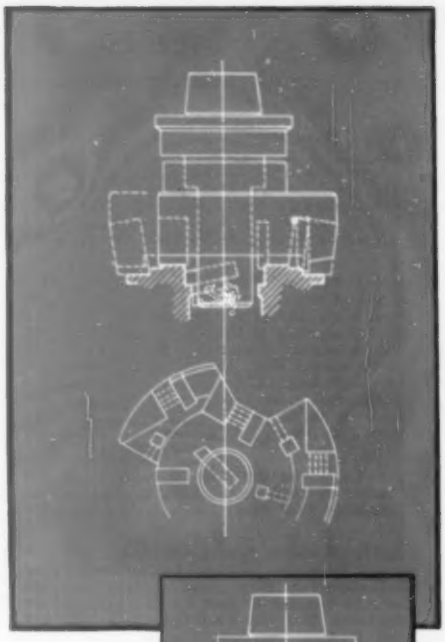
R and L Tools

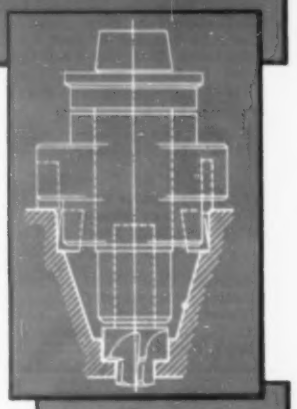
1825 Bristol Street **Nicetown, Philadelphia 40, Pa.**

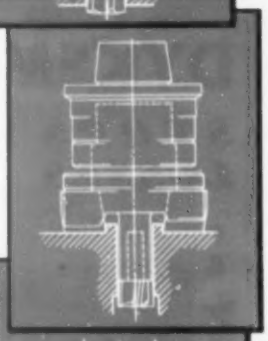
NEW! **R and L Acorn Die Holder**

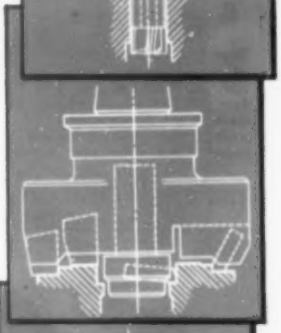
Available in a wide variety of sizes, these R and L Acorn Die Holders are real production "helps." Large keyed ring washer separates cap and lock-nut and facilitates tightening and adjustments. Design of cap and lock-nut speeds up and greatly simplifies the accurate adjustment of die. Clutch mechanism is same as used in the popular R and L Tap and Die Holder.











Drawings show complete tooling for a two-way, trunnion-type, four-spindle, roughing and precision boring machine, producing power take-off units. Each tool performs one or more operations such as boring, counterboring, chamfering, facing, and hollow milling.

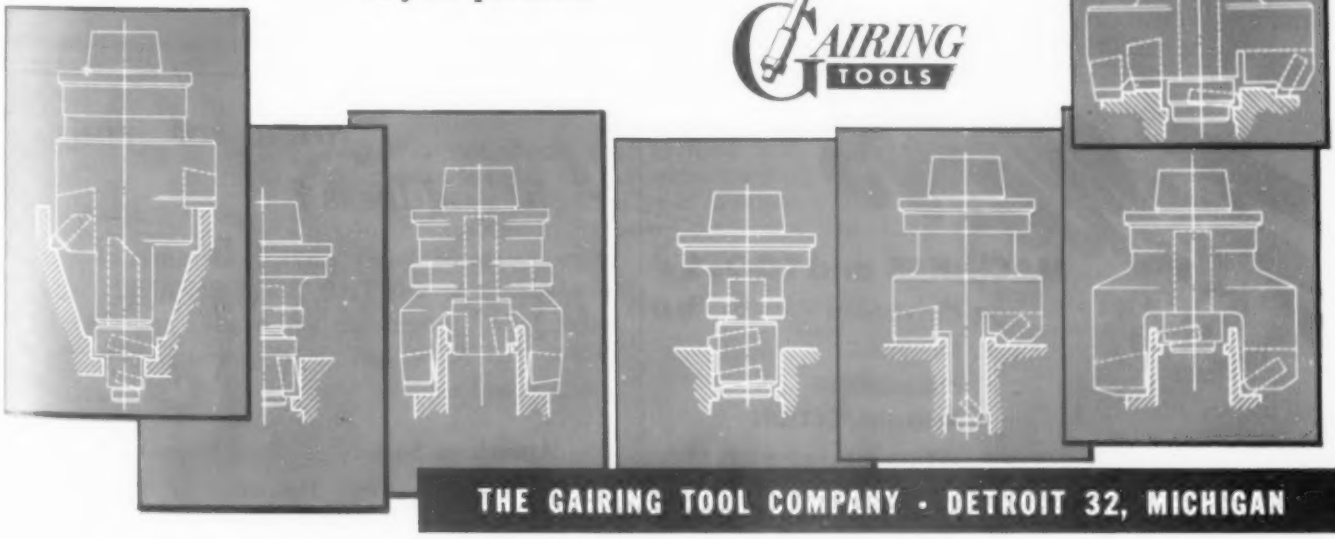
Multiple Tooling

More precision parts at lower costs are made possible through specially designed inserted blade cutting tools.

This actual example of multiple tooling recently completed by GAIRING suggests how the use of sound and proven principles of cutting tool design might improve the production of *your* machines.

So, if your present production falls short of expectations, let GAIRING'S engineers make a comprehensive analysis of your problem.

GAIRING TOOLS



THE GAIRING TOOL COMPANY · DETROIT 32, MICHIGAN

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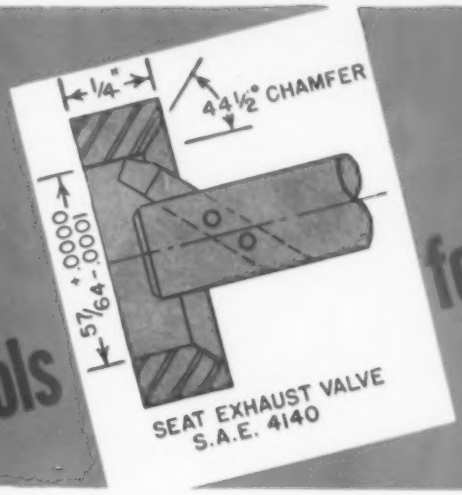


2 tools for the price of 1

...when V-R CARBIDE Is On The Job

The measure of carbide quality is in the performance. That's one reason why V-R Carbide tools give you consistent results where less tool cost and high production are key factors to profitable metal cutting operations.

Here's how ONE V-R Carbide tool outperformed all other carbides 2 to 1 on a standard boring operation.

Increasing costs reduced the profit on an exhaust valve seat boring operation to a point where a manufacturer decided to test various carbides in an effort to increase production and reduce tool costs and down time.

Testing various carbides on a four spindle boring machine simultaneously, other carbides produced 24 pieces before tool failure. V-R Carbide grade 2A7 produced 48 pieces when the test was stopped. Examination of the V-R Carbide tool showed only a slight trace of wear.

It was this switch from other carbides to V-R CARBIDE that provided another manufacturer with a sure margin of profit on a non-profitable boring operation.

test performance data

MATERIAL:	S. A. E. 4140 Rockwell 37C	
MACHINE:	Excello Four Spindle Boring Machine	
OPERATION:	Precision bore diameter 57/64". Width 1/4". Chamfer 44-1/2° angle.	
	V-R Carbide Grade 2A7	Other Carbides
S. F. M.	275	275
FEED PER REV.	.003	.003
DEPTH OF CUT	.045	.045
PIECES PER GRIND	48	24

● Why not check your carbide tool operations today for that extra margin at no extra cost! Call your nearest Vascoloy-Ramet Branch Office for V-R's experienced tool engineering service. For the best results try V-R Carbide or Tantung Cast Alloy tools and blanks NOW.

District Sales and Service in Principal Cities

V-R CARBIDE and TANTUNG

vascoloy-ramet corporation

WAUKEGAN • ILLINOIS

An affiliate of The Fansteel Metallurgical Corporation and The Vanadium Alloys Steel Company

In addition to the four continuous longitudinal walls, with cross girts at 12″ intervals on sizes up to 20″ and 24″ intervals on the larger machines, Sidney Lathe beds can be equipped with tool steel ways if desired.

The tool steel ways are ground in place on the machine providing longer life—and dependable accuracy.

This bed design provides three Vees and a flat. The two well proportioned outside Vee Ways take downward thrust and twisting strains and accurately guide the carriage for straight or taper turning and boring.

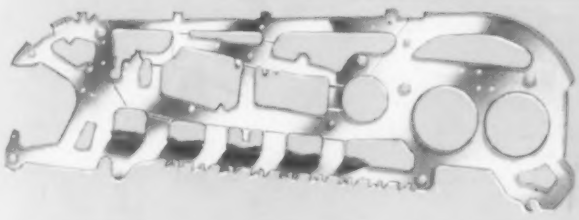
The end result is greater rigidity—less chance for misalignment and continued accuracy.

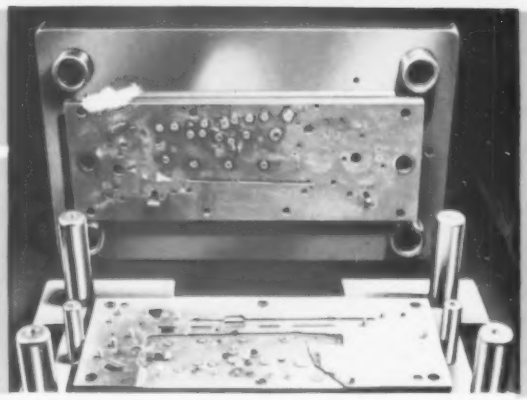
Bulletins on all sizes available

Precision stampings at Felt & Tarrant speed assembly of Comptometers

tolerances of 0.0005" held on 65 holes

. . . using DANLY PRECISION DIE SET





produces 23,000 steel stampings per grind

Here is a Danly Precision Die Set employed by Felt & Tarrant Mfg. Co. of Chicago to produce frame plates for comptometers—high-speed adding-calculating machines.

The die illustrated is mounted on a four-post Danly Standard Semi-Steel Precision Set. It trims, pierces, and notches 65 holes in .035 cold rolled strip steel. The work-piece is hand fed and positioned on dowel pins. A two-post stripper is used to prevent distortion. Production averages 23,000 pieces between grinds. Typical of other stampings produced for comptometers with Danly Die Sets, tolerance of .0005" on each hole is maintained which speeds assembly line work and permits complete interchangeability of parts.

Here again is evidence of the inherent accuracy of Danly Precision Die Sets under actual press operating conditions. Built to precision tolerances (guide posts and bushings ground to limits of .0002") they permit taking full advantage of the die maker's precision, help you hold close tolerances and get longer tool life.

Danly has a wide range of standard stock sizes available which can be quickly assembled and delivered to help you save time and money.

Danly Engineering Service
Consult our engineering department for helpful recommendations on die sets—large or small, standard or special—*for any type of press operation.*

DANLY NATION-WIDE ASSEMBLY SERVICE

Danly offices in 10 key cities give immediate attention to your orders. Assembly plants (marked with stars) stock interchangeable parts for quick assembly and delivery of any standard die set to your specifications.

- **Chicago 50,** 2100 S. 52nd Ave.
- **Cleveland 14,** 1550 E. 33rd St.
- **Dayton 2,** 990 E. Monument Ave.
- **Detroit 16,** 1549 Temple Ave.
- **Grand Rapids,** 113 Michigan Ave., N. W.
- **Long Island City 1,** 47-28 37th St.
- **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
- **Milwaukee 2,** 111 E. Wisconsin Ave.
- **Philadelphia 44,** 18 W. Chelten Ave.
- **Rochester 4,** 16 Commercial St.

get this *free* bulletin

Illustrates how Danly's Special Machining and Welding Service can save you time and money for unusual die set applications.

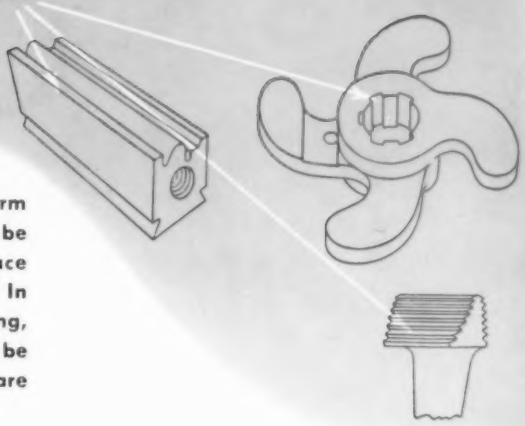
DANLY

DANLY MACHINE SPECIALTIES, INC.
2100 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

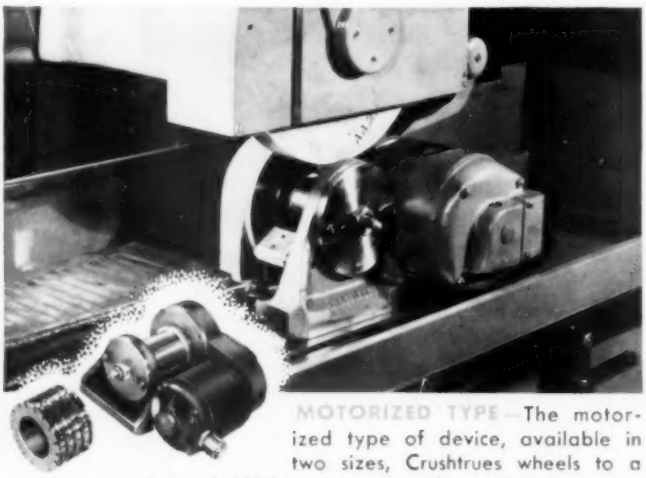
PRECISION DIE SETS...STANDARD AND SPECIAL

MECHANICAL PRESSES AND PRESS EQUIPMENT

Speed jobs like these ON YOUR SURFACE GRINDER

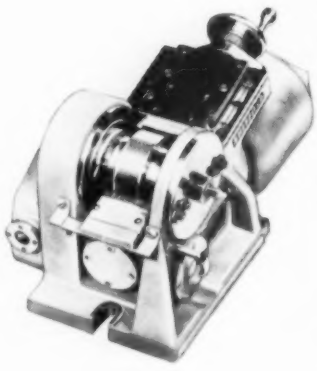


Production and toolroom forms for flat work including form tools, punch and die sections and similar work, can be ground by a Crushtrued wheel on any standard surface grinder equipped with one of these Crushtrue Devices. In this way, the many advantages of Crushtrue grinding, including its speed, accuracy and marked economy, can be utilized with a minimum of outlay for tooling. There are three general types of Crushtrue Devices.



MOTORIZED TYPE—The motorized type of device, available in two sizes, Crushtrues wheels to a width of 3⅛" and is generally used for quantity production operations.

IDLER TYPE The idler type is also available in two sizes. The smaller is used on grinders employing wheels up to 1" face. The larger utilizes wheels up to 3⅛" face. The units are generally used on grinders which have a slow speed spindle drive (approximately 300 fpm).

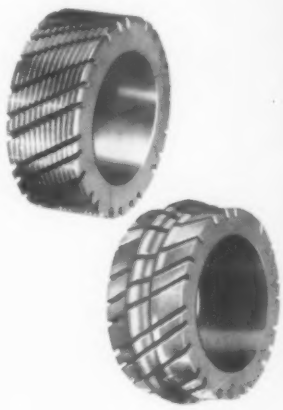


SELF-TRUING TYPE

The self-truing type is engineered especially for producing parts which must be held to a very high degree of uniformity. It incorporates a flat carbide form tool which is used to periodically reform the cast iron Crushtrue Roll without removing the roll from its mounting.

CRUSHTRUE ROLLS

Sheffield is prepared to regrind promptly, any Crushtrue Roll after it has become sufficiently worn in service. In addition to that, a large stock of standard rolls is maintained for immediate delivery or in exchange for rolls sent in to be reground. The Bank includes all Standard U.S. threads from 8 to 32 pitch inclusive.



Sheffield **would like to send you new literature describing Crushtrue grinding and its outstanding economic advantages.**

Thread and Form Grinders
Microform and Visualform Grinders
Gear Chamfering
Burring and Burnishing Machines
Crushtrue Rolls and Fixtures
Special Machine Tools

MASTER CRAFTSMEN SHEFFIELD HEADQUARTERS

the *Sheffield* corporation

Dayton 1, Ohio, U. S. A.

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